SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2158.—VOL. XLVI. LONDON, SATURDAY, DECEMBER 30, 1876. PRICE (WITH THE JOURNAL) SIXPENCE. PER ANNUM, BY POST, £1 4s.

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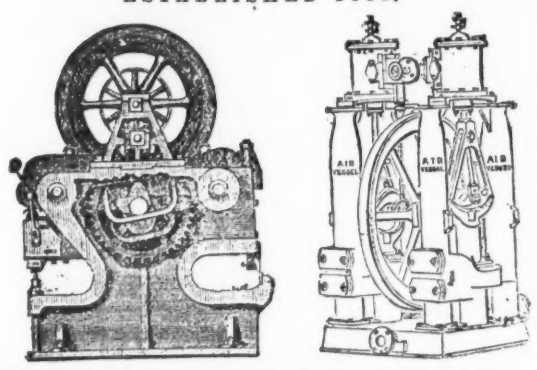

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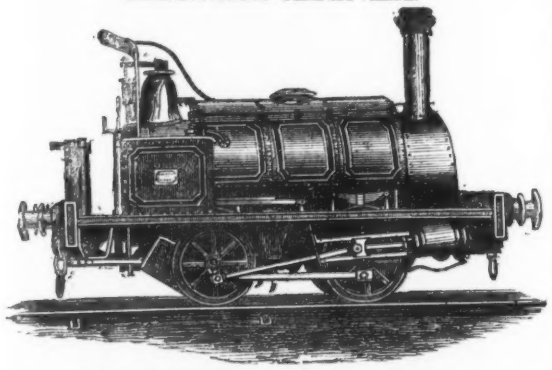

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A DIPLOMA—HIGHEST OF ALL AWARDS—given by the Geographical Congress, Paris, 1875—M. Favre, Contractor, having exhibited the McKean Drill alone as the MODEL BORING MACHINE for the ST. GOTHARD TUNNEL.

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At the south end of the St. Gothard Tunnel, where

THE McKEAN ROCK DRILLS

Are exclusively used, the advance made during eight consecutive weeks, ending February 7, was 24·90, 27·60, 24·80, 26·10, 28·30, 27·10, 28·40, 28·70 metres. Total advance of south heading during January was **121·30 metres, or 133 yards.**

In a series of comparative trials made at the St. Gothard Tunnel, the McKean Rock Drill continued to work until the pressure was reduced to one-half atmosphere (7½ lbs.), showing almost the entire motive force to be available for the blow against the rock—a result of itself indicating many advantages.

The GREAT WESTERN RAILWAY has adopted these Machines for the SEVERN TUNNEL; the LONDON AND NORTH-WESTERN RAILWAY for the FESTINIOG TUNNEL: and the BRITISH GOVERNMENT for several Public Works. A considerable number of Mining Companies are now using them. Shafts and Galleries are driven at from three to six times the speed of hand labour, according to the size and number of machines employed, and with important saving in cost. The ratio of advantage over hand labour is greatest where the rock is hardest.

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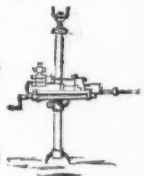

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Mr. BAINBRIDGE, C.E., of the London Company's Mines, Middleton-in-Teesdale, by Darlington, writing on the 20th March, 1876, says—"The yearly profit on our Nanthead waste heaps amounted last year to £600, besides the machinery being occupied for some months in dressing ore-stuff from the mines. Of course, if it had been wholly engaged in dressing wastes our returns would have been greater; but it is giving us every satisfaction, and bringing the waste heaps into profitable use, which would otherwise remain dormant."

Mr. T. B. STEWART, Manager of the Duke of Buccleuch's Mines, Wanlockhead, Abington, N.B., writing on 20th March, 1876, says—"I have much pleasure in stating that a full and superior set of your Ore Dressing Machinery has been at work at these mines for fully a month, and each day as the moving parts become smoother, and those in charge understand the working of the machinery better, it gives increasing satisfaction, the ore being dressed more quickly, cheaply, and satisfactorily than by any other method."

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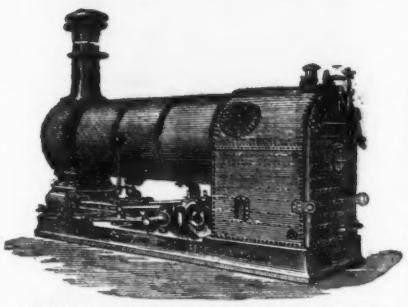

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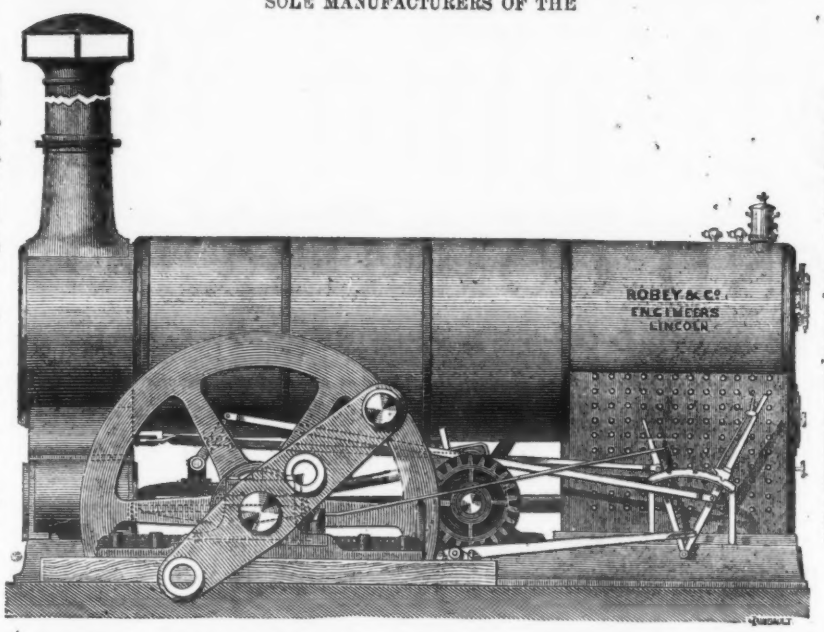

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This New Engine is free from all the objections that can be urged against using the Semi-Portable Engine for permanent work, because it possesses the rigidity and durability of the Horizontal Engine, and at the same time retains the advantages of the Semi-Portable in saving time and expense in fixing.

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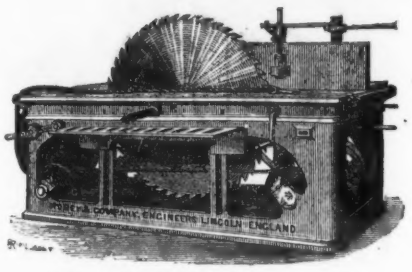

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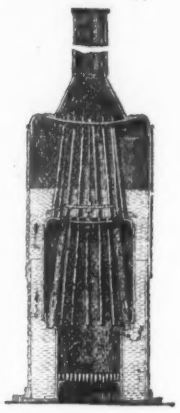

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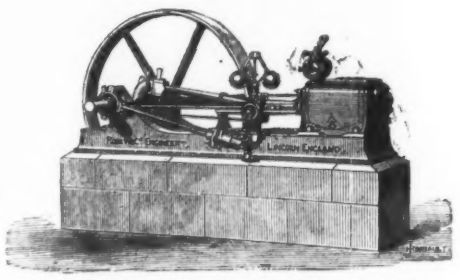

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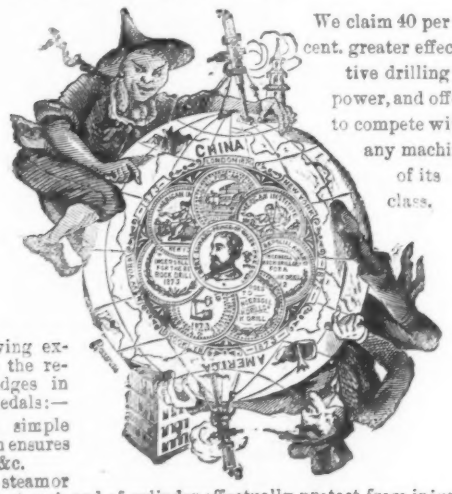

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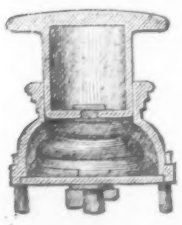

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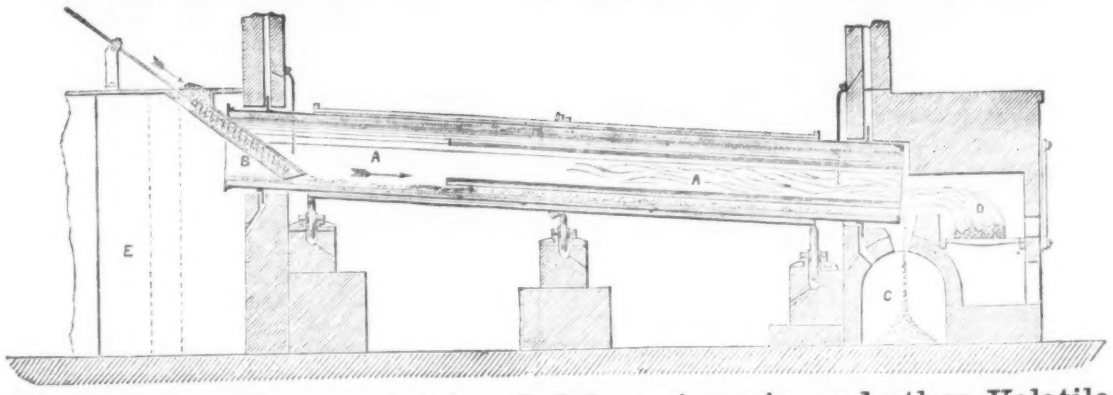

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For particulars, apply to—

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Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions.

STOURBRIDGE FIRE BRICKS AND CLAY.

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TECHNICAL EDUCATION IN CANADA.

MCGILL COLLEGE AND UNIVERSITY.

The praiseworthy efforts made by the collegiate institutions of Canada to provide within the province facilities for acquiring sound technical education have frequently been referred to in the Journal, and in connection with these efforts the McGill College, at Montreal, has certainly played a very prominent and successful part, and has now a large staff of competent professors and well-filled class-rooms—the students of all classes entered for the current session numbering, deducting double entries, 383; in addition to which there are 119 teachers in training in the Normal School belonging to the University, and 340 pupils in its Model Schools. The college, it will be remembered, was founded in 1811 by bequest of the Hon. James McGill, a citizen of Montreal, and ten years afterwards was erected into a university by Royal charter, though its successful progress can only be dated from its reorganisation by an amended charter in 1852, its present very enviable position being really the result of but a quarter of a century's exertions, and due, it might be added, to the energy and intelligence of the professors who accepted office at the time of the change and of men who were then just graduating, and have since strengthened the professorial staff, fully appreciating the improved organisation, and taking equal interest in the achievements of the objects in view when the change was made. There are at present 34 professors and nine lecturers, and many of the former—the Principal; the Professor of English, the Ven. Archdeacon Leach; and the Professor of Mathematics and Natural Philosophy, Dr. Alexander Johnson, for example—enjoy a high reputation not only in Canada and the United States, but wherever universities exist.

The statutes and regulations of McGill University are framed upon extremely liberal principles, and, although strictly Protestant, it is not denominational; it has full power to confer degrees in divinity, but that power has never been exercised since the reorganisation. It is provided that the governors shall not be more than 15 in number, and that they shall be laymen of some Protestant denomination, selected with a view to the representation at the board, so far as may be found practicable, of the several Protestant denominations in Lower Canada, and at the time of their nomination resident in Lower Canada. Every graduate of the university is a member of Convocation, and no person can matriculate as a student in any faculty without passing such examinations as the regulations of the corporation require. Especial care is taken that no student shall graduate until he has been thoroughly trained, four years' study being demanded for the B.A., and an additional three years for the M.A.; the LL.D. in course is only obtainable by a M.A. of 12 years' standing, and the D.C.L. in course is only open to the B.C.L. of 12 years' standing, a stated examination and exercises being necessary in each case to entitle the candidate to the superior degree.

It should be mentioned that an analysis of the Catalogue of Students shows that a fair proportion of the graduates proceed to the superior degree as soon as they attain sufficient standing, which may be accepted as an evidence that the instruction given them has made a lasting impression, that it has enabled them to pursue higher studies successfully, and that a large proportion of the alumni retain their interest in the welfare of their university long after their ordinary student's life may be regarded as finished.

Having thus shown that the academical distinctions granted by the university are worth striving for, and that the possessors of them must necessarily have obtained a large amount of useful information upon the subjects which must be studied to qualify for the degree held, the attractions which the McGill College offers to those intending to devote themselves in after life to technical pursuits will be more readily appreciated. The technical degrees granted are those of Bachelor of Applied Science, Master of Engineering, and Master of Applied Science, and the courses of study leading to them are thoroughly practical and complete. The department of Practical and Applied Science being included in the Faculty of Arts, students are subject to the same regulations for conduct and discipline as undergraduates in Arts. In practice the students appear to complete their first and second years in Arts, and then proceed with the Science course; indeed, the technical degree is scarcely obtainable otherwise, a circumstance which materially adds to the value of the degree when secured. For the science students three distinct courses of study are provided—Civil and Mechanical Engineering, Assaying and Mining, and Practical Chemistry—each of which extends over three, or in some cases two, years; that is to say, candidates may enter in the second or middle year if competent to pass a special examination in mathematics, English, and chemistry. The double degree of B.A. and Bachelor of Applied Science can be obtained in four years, and the student will by that time be well prepared to undertake the duties of his profession with credit to himself and advantage to those employing him.

As to the courses of study themselves it would almost suffice to say, as a guarantee of their practical nature, that Dr. J. W. Dawson, F.R.S., the celebrated Canadian geologist, is the principal of the College, and fills the chair of Geology and Palæontology, and that he is well supported in his utilitarian views by every member of the governing body; but, as some details will not be uninteresting, the courses of study in the several branches of the department may be referred to. The student preparing for civil and mechanical engineering pursuits is required to attend the lectures in mathematics, physics, natural science, modern languages, &c., as though he were an ordinary student in Arts, and, in addition, will have to take the full courses given by Prof. G. F. Armstrong, M.A., F.G.S., and by the lecturer in drawing and assistant, Mr. C. H. McLeod. The object aimed at in the course of surveying and levelling is to enable the student to be of immediate service upon entering the office of an engineer or surveyor, and, in addition to the lectures, a thorough course of engineering field work is undertaken by the class under the guidance of Mr. McLeod, during which the practical operations of the engineer in the field are actually carried out by the students. Geometrical drawing, construction, practical mechanics, and the principles of mechanism are in turn studied, the latter being illustrated by means of a valuable collection of working models—a not less important part of the course being that which bears upon designing and estimates. The instruction given under this head is intended to enable the student to apply practically such knowledge as has been obtained from the different courses of lectures, and consists in the design, specification, and estimating for such works as are usually undertaken by the engineer. Each student works independently under the personal supervision of the professor, and makes such drawings and calculations as would be needed were the structure designed to be actually carried out.

For students intending to devote themselves to mining and metallurgical pursuit the course is equally extensive and complete, the special subjects being taught by Prof. Harrington, B.A., Ph.D. The usual subjects in Arts have to be taken, as in the previous case, and with regard to the technical subjects those for the middle year embrace the use of the blowpipe and assaying, whilst the senior year is occupied by lectures on mining and on metallurgy respectively. The object of the blowpipe course is to enable students, by means of the blowpipe and a few simple reagents to detect the nature of various minerals or ores, and it is very truly remarked that on account of the small amount of apparatus required, and the rapidity with which accurate results may be arrived at, a knowledge of this subject will be found most useful to those engaged in geological and other field work. The course in assaying includes lectures and practical work; assays are made by various methods for gold, silver, copper, lead, iron, and other metals; examinations being also made of coal, peat, clay, &c. The mining course is an extensive one, and the syllabus shows that all the questions of importance in connection with modern mining practice are carefully considered—the headings, blasting and the nature and use of different explosives, hydraulic mining and sluicing, boring and boring machinery very properly occupying as prominent position as sinking, underground conveyance, special methods of working and preparing the mineral produce for market. There is also a short course of metallurgical lectures, illustrated by a series of ores and metallurgical products. The general properties of the metals and the nature of fuels, fire-clays, &c., are first discussed, and afterwards the more important metals and the methods of obtaining them from their ores by wet or dry processes are taken up in detail. The Practical Chemistry section is under the guidance of Prof. G. P. Girdwood, M.D., and includes a general course of qualitative and quantitive analysis adapted to the previous training of the student, leading in the latter part of the course to special studies adapted to his future pursuits.

As the college enjoys the advantages of large and well-ordered laboratories and lecture-rooms, and of abundance of apparatus for illustrating the subjects taught, the students adopting it have every facility for learning well and quickly, and assuming that the governing body will maintain those liberal principles which have already done so much for the university, and that the same amount of skill and activity will be displayed by the professors and lecturers, it cannot fail to continue to increase in prosperity, and retain its prominent position amongst the leading institutions of the province.

MINING IN NEW SOUTH WALES—No. III.

Again, take the Araluen Valley, which is a deep basin receiving all the drainage from hundreds of square miles of auriferous country, cut a tunnel through one of the hills at the lower end, turn the valley itself into a ground sluice, and work it with its never failing creek, and although the works would cost from 40,000*l.* to 50,000*l.*, the returns would be by millions, for this ground also is known to be highly auriferous for miles. I fear to say how many square miles, and as over a million has been already got out of a mere strip of the valley, and the water is too strong in the rest of the flats to enable them to be worked, there can be no doubt of what a large amount is left untouched in the ground. In very dry seasons a few trial shafts (in some cases only 20 ft. down to the bed-rock) have been attempted to be put down, but although gold was found in the wash-dirt (the latter varying from 1 to 5 ft. thick), yet the water was always too strong to be beaten, except by very powerful pumps, and as their cost would be from 3000*l.* to 4000*l.*, with the risk of sometimes being buried by floods, no one there cares to go into it, with the exception of two parties, who, being very favourably situated, manage to hold out.

The valley is so flat (comparatively) that the water lies in the bottom strata of the ground—up from the bed-rock—as if in a sponge, and the only really safe and profitable way of working is one introduced successfully by a mining engineer named Newman, who after some trouble found out where there was a slight fall of about a mile (just enough to let water run), and has built an underground tailrace of sawn timber, 5 feet × 3 feet, covered in and close boarded, and which directly it reaches the bed-rock (having only about 300 yards more to go) will, of course, drain all his few acres of ground completely, and leave him practically independent of floods even, beyond waiting for the water to run off. He is now within 4 feet of bottom, and having only to pump that short lift is even now washing about 400 loads per day, and although he has to strip from 10 up to 30 feet the average cost of all expenses per load is not more than 4 grs. of gold, so that by this method wash dirt that would not have been looked at even pays well, and ordinary stuff splendidly. He says that once fairly on the bed-rock, so as to save all pumping, and with an average stripping of (say) 10 feet, even 2 grs. will pay all expenses, and if so, considering that he still has to shovel, cart, and tip everything, what would the cost be brought down to were an outfall made at the lower end of the valley, thus completely draining the whole area, and then letting the creek wash down all the stuff into one main tailrace, so that water would do all the work that men, horse, and dray now does. Talk about the golden gravel claims of California, there is not a claim in the whole State could hold a candle to Araluen if thus worked.

I have gone thus fully into our special little claim, because it shows what can be saved and done, and also because it proves that although we see that at most 50,000*l.* would open out this known auriferous area, in which it is scarce an exaggeration to say millions can be unearthed for an outlay of a few thousands, yet no one has enterprise enough to start it. As to the land above it, and around Major's Creek (before referred to), it is a fact that scores of miners live comfortably by leasing little patches and raising the wash-dirt in dry weather (which means 11 out of the 12 months), and directly a storm does come guiding the surface waters into the sluices and washing away like mad. Probably the raising the stuff and washing it does not take three months out of the year, and the rest of the time they enjoy their enforced idleness; but if a head of water was brought on to this 5000 acres, most if not all of them (besides the thousands of others it would at once attract) would gladly pay 1*l.* per day for enough to wash with, so that the company or capitalist which first secures the water right at the river and brings it along could take these tolls along the course, and then finally use all the water at the end for their own area.

The profit is so really sure and enormous that even the sleepy inhabitants about there see it clear enough, and have "talked" about trying it for the last 20 years; but when a meeting was called to raise 100*l.* to "take the levels," and so prove the best route and distance, and arrive at the cost (which could not exceed 40,000*l.*, and is much more likely to be only 20,000*l.*) they even jibbed at subscribing that, and so go on watching their cows, their gardens, and the weather, and praying for a thunder shower (which to them is literally a golden shower), and when a longer spell of drought than usual comes abusing the Sydney merchants, who will not "help them to develope,' &c.; whilst the merchants, being just recovered from the late mania—not one in a hundred of them ever having seen a mine, and not one in a score even heard of "hydraulic mining"—are not to be "tempted" again into meddling with "things they do not understand;" and thus a district which in California would command the attention of the capitalist, and have long since been divided amongst a score of powerful companies, and thoroughly worked, is left all but untouched by us.

Our tin lands, again, are of great extent, several hundred square miles being more or less stanniferous, but here there is a little excuse for "Sydney apathy," as it is a broken country; carriage is high, and the price of tin low at home, and a long and fatiguing journey for directors to take if they wish to see what is really doing, but tribute parties do well, and there is such a wide field to pick and choose in, only working the very choice spots, or those near to reasonable carriage, but as soon as the railway goes through the district, which will probably be within the next two or three years (as it is getting on well towards it) thousands of acres will pay well to work if a little capital is first laid out in cutting races and buying water, though water is not generally difficult to get there, as it is a country of creeks and springs, as compared with most parts of the colony. The alluvial being so easily worked, little attention has yet been paid to the lodes, but several are known to exist, though none have been fairly proved as yet, and as deposits of stream tin have been lately found in ridges, and far above the ordinary wet workings, there is, doubtless, profitable employment for skill and capital for ages to come.

GALENA has had very little attention paid to it, nor do I know of any really well opened mine of it. Here and there a few tons are sent down, but the thickest known lode is not over 2 ft., nor has any yet been discovered rich in silver. The principal indications of it are found on our southern line of railway, about Bogolong Creek, and at Micalago, but as no real attempt has been made to sink and open out on any one vein no opinion can be offered as to whether it is payable there.

ANTIMONY may almost be put in the same category. We hear of good lodes at Nundle, at New England, and also in the western district, but as only a few tons are sent for shipment it is either hard to get or else other minerals in the neighbourhood pay better.

COBALT has been "scratched at" in the southern district, but the "country" is hard, and nothing more was done beyond getting 1 cwt. of specimens.

PLUMBAGO, in easily worked ground, but of low quality, was just opened up for about 10 ft. about three years since, but no quantity raised.

CINNABAR is known to exist, but no large veins or deposits have yet been found, nor has any real mining been done, although a deal of money was ignorantly wasted at one "likely looking" place in attempting to learn how to begin prospecting for it.

PLATINUM is occasionally found in small nuggets, principally in the alluvial tin claims in the North, but also sometimes in alluvial gold washings in the South, and occasionally small nodules of almost pure silver with it.

GEMS.—Several thousands of small diamonds, rubies, &c., were washed out of a gravel drift near Bingera, but none of any value; and a few decent sized ones have been found in the tin washing, and one found not far from Bathurst was sold for 200*l.*, but the working for them is not now carried on specially, Nearly every kind of gem, including opals, exists in the colony.

A report has just come down to Sydney of an extraordinary combination of wealth in one property, at an 80-acre lease, about 20 miles from Bathurst (and not more than 150 miles from Sydney even), where there is a large and rich gold reef, a rich silver lode, and a copper lode also, all within a few hundred feet of each other. My informant, who is a gentleman of position and veracity, says he saw the reef over 17 feet thick, and not even then worked through, so that it may be very much more, and that with only six stamps at work they were getting an average of 600 ozs. of gold weekly, and that so far as the look of the great body of stone in sight went, it was only a question of more men and more stamps to get more gold in proportion to the labour employed. Several hundredweights had already been sold by the two owners (Winter and Morgan), but the silver and copper had only been prospected, and not opened up at all. Winter looks on his share in it as representing hundreds of thousands, and yet such are the vicissitudes of mining, and our miners' general ignorance of the geological indications, &c., that this very property was twice prospected and twice abandoned by different owners.

Not far from it there is a large hill of conglomerate, quartz, &c., which shows gold wherever prospected, and which if it only went 5 dwts. per ton ought to be a large fortune when worked, and which the owner offers a very large interest in to anyone putting up the battery to crush it (which would not cost altogether more than 1000*l.* or 1500*l.*); and yet in the present state of feeling the probability is he may wait for months, or even years, before he gets it taken up on any terms at all.

Of course the present state of things will not continue for very long, because our traders will find it to their interest at last to help, even at some risk, the development of likely mines; just as in Victoria, where the storekeeper and publican, and butcher and baker, know if the mines are not supported they may not soon be either; and they go on paying calls regularly—in some cases for years before the return comes—and as a rule it pays them as a body. So with us, although there will still be individual losses, there will be a general gain, and before the next seven years are over scores of "abandoned" mines will be profitably worked, on a co-operative principle probably, and not a few proved successes. Confidence will be restored, careful management and easier supervision, both of manager and managed, will lead to profitable results, and mining in New South Wales become a settled industry and a recognised channel for investment.

R. D. ADAMS.

Sydney, N.S.W., Oct. 26.

MANUFACTURE OF IRON AND STEEL.

SIR,—In connection with the manufacture of iron and steel, when the iron ore mixed with carbonaceous matter and fluxes is treated in a rotatory or moveable chamber, heated either by a gas furnace or coal or coke furnace, some important improvements have been patented by Mr. S Lloyd, of Birmingham, for he succeeds by puddling, physicing, &c., in converting the rubbish known as direct-process iron and steel into a really merchantable article of scarcely inferior quality to that produced by the usual methods. To remove the whole of the objectionable properties from iron produced in the rotary chambers mentioned is of course out of the question, but Mr. Lloyd has entitled himself to the highest credit for having succeeded so well as he has done. The iron ore is, according to the process in question, reduced, and the iron or steel—whichever the manufacturer may prefer to call it, for it is equally unlike either—resulting is shingled and finished in the usual way, but it is generally impure and red-short, and Mr. Lloyd's object is to convert it into iron or steel of excellent quality. He reduces the "shingled and finished" metal by shearing, cutting, or stamping into small pieces. He does not limit himself to any particular size, but in practice finds pieces not exceeding an inch in thickness answer very well. He heats the said lumps of iron or steel mixed with charcoal, coal, or coke on the bed of a furnace, and prefers to direct jets of air upon the iron during its treatment in the furnace. He applies a very strong heat, and stirs the mixture with a rabble, or other stirring tool. During this treatment the greater part of the impurities in the iron or steel melt out therefrom in the form of cinder, which may be tapped off in the ordinary way. The quantity operated upon may be as much as is sufficient to make a ball as large as the workman can conveniently manipulate. After the iron or steel has been operated upon in the way described it is withdrawn from the furnace, and hammered or squeezed after the manner of a puddled ball, after which it may be rolled into bar-iron or steel. Scrap-iron, carburised iron, or cast-iron, or spiegeleisen in small quantity may be added to the mixture of small lumps of iron and carbon and flux. The said addition is not, in Mr. Lloyd's opinion, necessary, but he finds that it is in some cases beneficial.

It appears that the iron or steel made by this process is of excellent quality, and this the practical man can readily understand, for he in effect claims the right to apply any and every known method of manipulation to the direct process iron or steel, and treats this metal precisely as though it were ordinary pig-iron. He states that in carrying his invention into effect he ordinarily operates upon so much iron at a time as a puddler can conveniently manipulate, but does not limit himself thereto, as two or more persons may simultaneously operate upon the same charge of iron, and a large mass may be operated upon by mechanical appliances for lifting and removing the mass from the furnace. He says, moreover, that he does not limit himself to the use of any particular kind of furnace, as any furnace which, besides being of a construction convenient for the operations of the workman, also provides for an ample supply of air, either by blast or otherwise, may be employed. He has, however, found in practice that the furnace used in the iron manufacture, and called a charcoal fire or furnace, answers very well. The said charcoal fire or furnace consists of an open furnace urged by one or more blasts of hot or cold air. The fuel ordinarily used in the said charcoal fire or furnace is either charcoal, coke, or the small coke called "breezes." For ordinary qualities he uses coke or breezes, but when iron or steel of an exceptionally good quality is required he employs wood or peat charcoal, either alone or mixed in such proportion with coke or breezes as the workman finds necessary to produce the required quality of iron or steel, which fuel may be introduced into the furnace along with the air. Although he prefers to urge the furnace with one or two blasts of air, yet he does not restrict himself to any particular number. As a blast or blasts of air act only by virtue of the oxygen they contain, he does not limit himself to the use of blasts of atmospheric air, as other gaseous mixtures containing oxygen may be employed instead of air. Instead of employing coke or other solid fuel exclusively gaseous fuel, such as is obtained by the combustion of carbonaceous matter with limited access of air, and which gaseous fuel consists essentially of a mixture of carbonic oxide and nitrogen, may be employed, so as to lessen or save the consumptson of solid fuel, but he prefers the use of coke, breezes, and charcoal as being more readily controlled by the workman.

There is another question in connection with Mr. Lloyd's invention which is worthy of consideration—whether the physic which he administers has not more to do with improving the quality of the iron than the process itself, for he states that the scrap iron or steel which he adds to the iron operated upon may be of various qualities. The added iron or steel may be reduced to a suitable size by granulation. The granulation may be effected by melting the iron or steel and pouring it from a considerable height into water, as is well understood. Where the iron is free, or so nearly free

"om carbon that it cannot be granulated in consequence of its insibility, he reduces such iron to small pieces by shearing or otherise. Any kind of steel may be employed in carrying his invention into effect. He has found in practice that an excellent result s obtained by the employment of equal quantities of the iron to be operated upon—that is, direct process iron, scrap iron, and scrap steel. Where a very soft quality of iron is required the proportion of direct process iron should be increased. In operating upon the iron to be treated, or on mixtures of the iron to be treated, and scrap iron or steel, he employs a flux consisting of hammer slag, or native or other peroxide of iron or mixtures of these. Common salt may also be used in addition. These fluxes are employed in the ordinary way.

With regard to the uses of the iron and steel treated and improved according to Mr. Lloyd's invention, he considers that it may be advantageously employed in conjunction with iron manufactured in the ordinary way, and he remarks that bars made according to his invention piled with bars of ordinary iron for the manufacture of sheets, plates, or bars greatly improve the quality of the finished iron. I am disposed to believe this, but should like to know at what price the Lloyd metal can be produced, as I should think it would be much more costly than that of similar quality produced from pig-iron.—*Deritend, Dec. 27.* DUBIOUS.

THE ARSENIC TRADE.

SIR,—I see by the newspapers that I am reported to have said at the Devon Great Consols meeting that the present price of refined powdered arsenic is 17*l.* per ton. What I stated was (in reply to a shareholder) that 17*l.* per ton was the highest price obtained—in March, 1875—since the Devon Great Consols Company commenced the manufacture, and for that year their production was sold privately to Messrs. Drayton at 8*l.* 15*s.* per ton net f.o.b. Tamar, so that if, as stated by the Chairman of the directors, Messrs. Drayton have a losing contract this year, they must have had a very profitable contract last year, as 17*l.* per ton, delivered London, Liverpool, or at a continental port, less charges, would be equal to about 15*l.* per ton net at place of manufacture, and the average price for the year 1875 was about 50 per cent. beyond the price obtained by the Devon Great Consols. The company paid a higher average price last year for crude arsenic than was obtained by the Devon Great Consols Company for their manufactured article (casks included, costing about 1*l.* per ton); this shows conclusively the advantages of competition to the producer. Your correspondent who signs himself "One who has an interest in both" is very far from the mark in his estimation of the production of arsenic by the several makers; some are stated at about one-half of their manufacture, others at about double, the name of one maker is omitted, and another name inserted who makes none, and never did, so that your correspondent should revise his own statements before he endeavours to correct those of others. THOMAS W. FIELD.

Cornwall Arsenic Company, Marazion, Dec. 26.

SCIENCE IN ITS APPLICATION TO MINING.

SIR,—That mining depends for its due success on the application of science in its several departments no one engaged therein will attempt to deny. But is the acquisition of so much and varied knowledge as is comprised in the several sciences, which are applicable to and embraced by mining, attainable by one and the same individual, who, to become practically proficient in its administrative and detail departments has to devote so much of his time and attention? A knowledge of chemical science, it is frequently urged, is indispensable to complete the education and efficiency of a practical mine manager. Now, is that so? Chemistry being an experimental science I would like for some practical chemist to favour us with his views of the subject. We admit the utility of chemistry to mining, and not only so, but its indispensability to its proper working. But the training of mine agents in chemical laboratories we do not believe in, but to make them chemists without would be to disregard the maxim that "a little knowledge is a dangerous thing." Supposing a mine manager or mine managers generally were competent chemists, I would like to ask the shareholders in mines if, when visiting them, they would be pleased to find their chief agent in a little pent up room, in his shirt sleeves, surrounded with phials and test tubes, with the numerous necessary reagents—liquid and otherwise—engaged in analysing mineral substances? for analyse he must to ascertain their constituent parts. What does it avail to know the particular ingredients of which a mineral or minerals may be composed? Would such knowledge resolve the doubt in an agent's mind respecting the direction he ought to pursue in searching for a lode which had been displaced by a cross-course? Would it determine him in any matter on which he had doubt, whether with reference to the direction of a displaced lode or assure him in respect of its quality when found? It may be replied that that is not the intended function of chemistry in its use and application by practical mining engineers. I am aware of that, and that assaying and blow-pipe analysis is more nearly what is intended. But in this country, where assaying is done so cheaply by professional and practically qualified operators, would it not be the reverse of economical for practical mining engineers—even if equally well qualified—to engage in the business? In some foreign countries a knowledge and aptitude in this branch of chemistry is invaluable, especially where ores of a mixed character and indeterminable value are found; and even where the ores are not so mixed, but consist of one class only, a knowledge of their value is a great desideratum—great in proportion to the distance, inconvenience, and expense both of money and time in transmitting samples and obtaining the result from professional assayers. I have known men ride post haste from 70 to 100 miles to get a sample of ores assayed, and during their absence the works have been in abevance, pending the result of the assay. But inconveniences of that kind only occur under what may be termed "abnormal" conditions of mining—searches for discoveries in unsettled and remote regions. I had a complete apparatus whilst I was abroad for the reduction of all kinds of minerals, metallic and otherwise, and had very frequent use for it both on my own behalf and for the accommodation of others, but here I have little or no use for it—not once in a year on an average have I had recourse to it since my return, and then only from mere curiosity. I do not need it in directing the operations of a lead mine in this country. It is immaterial to me, to my purpose, to my interest, and to my object whether the baryta in this mine is in combination with calcite, or *vice versa*, the calcite with baryta, as we have not the latter in saleable quantity, and the former, of course, is of no value. Nor is it material to the productiveness of the lodes, each separately, or one without the other, would be just as well; but this depends on other conditions.

Mining is a great productive industry—fundamental alike to civilisation, to commerce, the arts and sciences, social and domestic happiness and economy, and on the products of which depend the instrumentalities which annihilate distance, outstrips time, promote the intercourse of nations, and attest the universal brotherhood of man. Its province is peculiar and many-sided, so that its chief art consists in applying to its own purpose and development all available practical arts and sciences. But the question arises as to the possibility of individual men acquiring a competent knowledge of every branch of science which lends its aid to mining; and further, supposing that this was attainable by any educational process, the difficulty of its application would then arise unless the persons so accomplished were endowed at the same time with ubiquity. No one can be in two places at one and the same time, or perform in the same place two separate and distinct services each requiring the whole of his attention at one and the same time, and, therefore, there is a limit to his capacity, whatever may be the nature and extent of his acquirements and attainments. If the ordinary duties of mine management are sufficient to engross the whole of one's attention, and I affirm that they are, to divert time and attention from those to experimental chemistry would be akin to ignoring the substance and investing the shadow. If Cornish mine agents are as ignorant as they are frequently said to be, and as they sometimes confess themselves to be, although I always regard such admissions as a feigning of modesty, and doubt not that if such a compliment were paid them by others it would be warmly resented. What, then, is to be done? If men of superior intelligence, education, and adaptability for the purposes of mining fail to attain the real excellence which is demanded, and to which no one has ever yet attained, to what good will it tend to flaunt an ideal curriculum in the face of mine agents with the words "impossible of attainment" written in legible characters underneath?

As miners we deal with the practicable and probable, and if science can assist us in any department we gratefully accept her aid. But the science of mining in the abstract is distinct from the collateral sciences, although as auxiliary branches they render important and, occasionally, invaluable service to it. I am aware it has been said so frequently that "practical men are opposed to the innovations of science," that the utterers of that slander have got to believe it is true. But my experience has ever been the reverse—it has been the theorists and scientists who first show contempt for their practical contemporaries.—*Llanrwst Mine, Dec. 26.* ROBT. KNAPP.

LIMITED COMPANIES, AND THEIR CREDITORS.

THE RIGHTS OF DEBENTURE-HOLDERS.

SIR,—The irreparable injustice inflicted upon creditors of limited liability companies by friendly petitions to wind-up has been pretty clearly shown in the case of the winding-up of the Wayne's Merthyr Colliery Company, which was again before Vice-Chancellor Malins a few days since. The readers of the Journal will scarcely require to be reminded that the company in question purchased their extensive ironworks and collieries only about two years since for 300,000*l.* at a period when much colliery property exchanged hands at prices which betokened the temporary insanity of the purchasers, and permitted the vendors to accept a large proportion of the price to be paid in shares, bonds, or any other kind of paper of speculative value, as the balance would probably represent the intrinsic value of the property transferred. Whether the Wayne's Merthyr Company's property comes within the same category is a question which is not at present raised, but it is one which, although directly interesting to none but the sellers and purchasers, is of great indirect importance to creditors, inasmuch it is left for them to prove that they are to be paid before the debenture-holders, even in the case of companies where the original vendors are the principal debenture-holders have had control of the arrangement for the whole continuance of the company, have aided to bring about its difficulties, and then reclaim the entire concern under their debenture-holders' rights. From the facts brought forward it appears that, although the property was so recently sold to the Wayne's Merthyr Company for 300,000*l.* upon the faith of an auditor's report that the profits of the preceding year had exceeded 63,000*l.*, the concern was penniless 18 months after the transfer, although there were assets in the shape of stocks of coal and book debts which would have paid every unsecured creditor more than 20*s.* in 1*l.* Yet even now the creditors remain unpaid, and the assets are becoming gradually less.

The creditors had, of course, no voice in the matter of winding-up until it was too late to act, except individually, and for an individual to act against a company involves so much cost and waste of time that very few are in a position to oppose any step that may be taken. In the case of the Wayne's Merthyr Company the result appears to have been particularly disastrous, for it appears that when in July the unsecured creditors attempted to press a settlement of their claims, one friendly creditor was induced to instruct the company's solicitor to present a petition to wind-up, and the auditor of the company was appointed interim liquidator. The debenture-holders, which it may be assumed included the vendors, obtained possession of the property, and the property has now, with the sanction of the Court, been offered for sale, and failed to find a bidder, so that it may be anticipated that the next step will be to re-sell to the original vendors at a nominal price, and thus all that was practicable will have been done to ruin the shareholders and the creditors, whilst the vendors, to say the least, lose nothing by the transaction, and it may realise an actual profit.

Whilst affairs are carried on in this manner the confidence of the public in joint-stock enterprise cannot reasonably be hoped for, yet the remedy for the evil is simple in the extreme. The admirable example of the Vice-Warden of the Stannaries should be followed—no one but an officer of the Court should be appointed liquidator, and in the event of an order to wind-up the entire question of the transfer of the property should be re-opened, and vendors who have transferred surreptitiously, and at prices fixed by themselves, and not in accordance with fair valuation, should be punished accordingly. ——— J. R.

BORLASE'S METALLIC ORE DRESSER.

SIR,—Mr. Edward Borlase, who has already conferred very great general benefit on the mining community by his introduction of his well-known concave buddle, and other improvements in dressing tin, lead, and other ores, has again come to the front with a new dressing machine, which is, I believe, destined to supersede many less perfect contrivances in separating the various ores from the poorer rock. This machine may be seen at work any day at Pednandrea, Redruth, where it has been doing good work for some weeks in taking the poorer-class tin ores, and in one operation delivering the "whits" ready for the calciner. It is in form a combination of buddle and frame—a very pretty machine to look at—and the manager informed me that he believes it applicable to every class of work on a tin dressing-floor, saving quite four-fifths of the labour previously required, and doing the work better. So satisfied is he with the result that he has made arrangements with Mr. Borlase for putting up more machines forthwith; the present, and first constructed in this neighbourhood, having in the short time it has been at work already paid the cost of construction in the better dressing of the tin, and in the cost of labour saved. Anyone interested in dressing metallic ores will find that an hour applied to an examination of this new and beautiful machine of Mr. Borlase's is an hour well spent. ——— METALLURGIST.

THE NASCENT PROCESS, AND THE NEW CONSOLS, &c.

SIR,—I have read with interest the able speech upon this subject of Capt. R. Pryor, at the Camborne inaugural dinner of the Mining Institute, and having patiently bided my time, now consider that the season has at length arrived for me to disclose my version upon the matter. I have no ill feeling against Capt. Pryor, and am more deeply grieved than annoyed that a Cornishman, and one of the head representatives of the grand and beneficial pursuit of mining, should refrain from finding the manly heart to at least say a few words in favour of one who was the sole instigator and inventor of the process, and saviour of the New Consols from becoming a total wreck. These are no mere idle words, they are simply truisms, and one might be almost induced to consider that life-long gratitude would naturally flow within the breast of a man who, at the eleventh hour, when not a vestige of hope was discernable upon the horizon, by the helping hand of another was saved from the very vortex of despair, and is now reaping honour and glory in lieu of being dragged into the merciless torrent of ignominy, defeat, and ruin. *En passant*, there is no doubt that each of us, one and all, have some particular favourite hobby or property, and the gift of necromancy is not required to distinguish that New Consols is the pet project of Capt. Pryor, the same as the Virtuous Lady Mine had my fondest cherished hopes and ambitions. Alas! when I look back and reflect upon what might have been with regard to this property. The very blood curdles within me when I think of the treachery of some of the promoters, who, after having realised fortunes entirely though the faith of the public reposed in me, did their utmost to strand the ship for sinister motives. But enough. I will be calm, and with regained composure remind my readers that the several improvements introduced and now perfected by me, after years of toil, for commercially successfully treating low-class ores would (if then known) have carried into practical effect all the predictions I entertained and publicly announced respecting this marvellous property. What would have been my feelings, Capt. Pryor, when breakers were ahead had some Good Samaritan come forward with sound practical scientific researches and assistance, enabling me by timely aid to steer clear of wreck and ruin, and keep faith with the patrons who had so kindly entrusted their confidence and money into the hands of a comparative stranger? Echo answers—blessings, honour, and all the substantialities of life would have been showered upon him; but, ah me! in this particular instance under narration no helping hand was extended to save the drowning one, and mid the ribald jokes and jeers of those who had lined their pockets through his instrumentality, and the groans of those whose exchequer were for a season reduced to zero, he sunk, supposed to rise no more. THOS. J. BARNARD.

Hole's Hole, Roborough, Devon, Dec. 27.

[*To be continued in next week's Mining Journal.*]

TREATING POOR ORES.

SIR,—I hear from good authority that Mr. Barnard has lately invented and patented a new style of furnace and chemical appliances, which will for a first outlay of 200*l.* treat 20 tons per day for 10 cwts. of coals, or only ½ cwt. per ton, by which he claims to operate upon ores giving only ¾ to 1 per cent. copper and 2 ozs. of silver per ton, getting the whole out to net profit, or no cost whatever, as the bi-products never recovered until, by his plan, now more than entirely pay for the reduced cost of extraction. This is a step in the right direction. ——— F. C.

CORNWALL MINING INSTITUTE.

SIR,—In my letter of last week, in speaking of this institution as a valuable addition to other cognate institutions of the county, I called one the Mining School instead of the Miners' Association for Devon and Cornwall. The Mining School—an institution started by the late Sir C. Lemon 35 years ago at his sole expense—after a brief existence came to an end for want of funds, because at that time the great mining men of Cornwall underrated technical learning as applicable to the conduct of mining works. They were men of the old school, who advocated practical knowledge as almost entirely independent of, if not opposed to, theory—an erroneous notion. At the present time a vast amount of good is being done by Mr. Kitto and others in the chemical classes established in the county, by means of which young men are being prepared for the proper discharge of all the duties attached to mine agency. The works at New Consols show the value of chemistry in the separation of all the metals—copper, tin, silver, and arsenic—from each other, as well as from the debris, and the science brought into exercise in that mine will, ere long, be brought to bear on other lodes of analogous character in West Cornwall, in mines which hitherto, from want of that science, have been unprofitable. Cornish agents in general are intelligent men, but the next generation will doubtless be superior because of their chemical education. The Cornwall Mining Institute, I doubt not, will be instrumental in the product of a great deal of good. I understand that Capt. W. Teague, jun., of Tincroft, was the originator of it.—*City of Truro, Dec. 28.* R. SYMONS.

IMPROVED SYSTEMS IN CORNISH MINING.

SIR,—I was very much pleased with the remarks made by Capt. R. Pryor at the Mining Institute, on the 18th inst., as to the adoption of the wet process for the treatment of low-quality copper ore. I have conversed with several parties who have visited the mine, all of whom express themselves to be well pleased. I intend, however, to pay a visit to the mine, and then will express my opinion on paper. I am quite satisfied there is a great future for Cornish mining, but our attention must be directed more to chemistry, and not so much to the system of bygone days—the forking of old mines for tin. This mineral is now found in several parts of the world, and in some places abundantly, and the only alternative we have for competing with other countries is to fully adopt the improvements in machinery which are gradually being introduced. The rock drills (no matter whether the Burleigh or Diamond) must find their way in Cornish mining like wire-rope, Bickford Smith's fuse, skip roads, Blake's stone-breaker, as well as other equally valuable machines.

I trust that Mr. Basset will continue to carry out his views in support of the new system of mining, and I sincerely hope that Mr. John Michael Williams (who, I have been given to understand, is well up in chemistry) will lend a helping hand in this important matter, when Sir F. M. Williams, Bart., Mr. George Williams, and Mr. T. S. Bolitho will undoubtedly be forthcoming to assist as well; and if so, should tin continue at the present price for some time to come, we shall shortly see the old county in its glory again. Possibly the old-style mine agents may not think so much of chemistry, for which reason they should be kept together by the gentlemen above named, and if so the results of the new system will be crowned with success, and with other new machines to be introduced we shall be able to compete with the world for the various minerals which we treat; and why, I ask, should we not? The wages in Cornwall, as compared with other countries, are very low, and if the men be set to in the same way as in the St. John del Rey, for four, five, six, seven, or eight months, and have a little subsist when required, no time hindered by means of four-weeks pay, and men's wages not cut, but rather increased if the contract be completed in less than the time specified, we should do much better than has been done, for time in Cornish mining is money. CHEMIST.

Camborne, Dec. 27.

LLAN GAN LEAD MINE.

SIR,—Having now returned from a visit to South Wales, and during my stay there having come across the above mining property, and being so thoroughly convinced of its value, and knowing your valuable Journal is always open to the publication of good mining news and important discoveries, I venture to send you a few remarks for insertion on the above mine, which is in the neighbourhood of Cowbridge, and county of Glamorgan.

I am informed this undertaking was commenced by a private company about 12 months since, who have explored the grant to a good extent, and opened on the backs of several large and productive lead lodes. When I speak of backs of lodes it should be borne in mind that this is a piece of new or unwrought mineral land, the deepest point yet reached being about 120 feet. Having myself some knowledge of mining in its various branches, with the advantage of 30 years experience conducting mines, the first sight of the works here led me to be curious enough, with the kind permission of those in charge, to carefully look into the nature of the formation, size bearing, inclines and characteristics of the different lodes. The first important object that caught my eye at surface was the large heaps of lead ore which had been broken from the lodes in the short space of time before named and constantly accumulating, and on examination of the same I found no difficulty in arriving at the conclusion that it was the finest yield of lead ore I had ever met with in any new mine to the depth of 120 feet, and seldom at a much greater depth, and I do not hesitate to assert that the very best mines in the Principality could not compare with this at the same depth. After a surface view of the many points of interest I turned my attention to the nature of the formation, and I soon found it to be the right sort for producing lead of the kind I had previously examined, and such as the best mines in the kingdom have been discovered in. The lodes are large and well defined, running in various directions, and forming junctions and intersections, which are features of the utmost importance for profitable mining. The main lode at the points I examined is about 10 feet wide, rich in lead throughout, the whole being sent to surface and stored, waiting the completion of machinery, now in course of erection, for dressing and other purposes. A new engine-shaft is being sunk in a central position for commanding the various lodes easily. There has not only been a deal of underground work accomplished in the time, but the company being alive to the importance of their undertaking are not slow in applying the necessary machinery and outlay to carry it to a successful issue. There is now delivered on the mine a Cornish engine of ample power for pumping the water and crushing the ore, a powerful ore crusher, bobs, rods, and pitwork, capstan, shears, &c., the whole being supplied by the well-known firm or Messrs. Harvey and Co., of Hayle. The engine-house is up, and other buildings going on rapidly, and I judge (weather permit-

ting) the whole of the machinery will be in full operation by the end of January next, and returns commence. The outlay of capital by that time will be some thousands of pounds, but being well spent the company may congratulate themselves on having a most splendid property, with a very moderate outlay, from which 100 per cent. per annum is not too much to expect after another year's development, and from the time the crusher is at work outlay may be considered at an end, and profits begun. I see no mention of this company in the Journal, and, as I before stated, I understood it to be in private hands. I wish them, however, the success that appears to await them, and would like to see more such mines, so well selected and carefully and energetically worked. SURVEYOR.

Stamford, Dec. 22.

NORTH LAXEY MINE, ISLE OF MAN.

SIR,—As a resident in the island, a shareholder in this mine for nearly 20 years, and the holder at present of a very considerable number of shares in the concern, I need scarcely say I have watched its progress with a great deal of interest and anxiety, and it is now to me a source of great satisfaction to find that the mine is now to all human probability on the point of turning out a success. In proof of this I am informed that the returns will be immediately increased, and can be well maintained. If this be so there is no man who will have earned his laurels harder than Capt. Rowe, the founder and manager of the mine, to which he has stuck through evil and good report, and has always contributed to the capital as wanted, and can only be rewarded by ultimate success. To this end his perseverance and anxiety can be fully attested by, I believe, all the island shareholders, and further, I understand that the Crown Inspectors, who are not easily satisfied, have up to the latest expressed exceptional satisfaction with the courage and energy with which the mine is being followed up. The watching of the next few months' reports of the operations at this mine will be a matter of great interest to all concerned. A LARGE SHAREHOLDER.

Douglas, Dec. 26.

SOUTH TOLCARNE MINE.

SIR,—The important discovery communicated to the shareholders of this mine at the meeting reported in last week's Journal cannot be over estimated. Great expectations are formed that the South Condurrow lode, now cut into at the 50, will prove as rich as in its neighbours; by others it is believed that it will prove much richer, from the fact of Fraser's lode—a fine masterly one—having dipped into this great tin lode. Fraser's lode will now be drained at the 40, and can be sunk upon at once. This lode has produced rocks of almost pure tin. Considering the improved and rising markets for tin, a grand future appears to be in store for this property. There are only 4500 shares, 1500 having been forfeited, thus giving the fortunate shareholders the benefit of their inability to pay the continuous calls. This week will, it is expected, see the lode cut into and its value will be declared shortly. Few mines in Cornwall offer a greater chance of immediate and unlimited success.

"CORNWALL."

SOUTH TOLCARNE.

SIR,—The proceedings at the late meeting in London of the South Tolcarne Mining Company contained an incident which has excited surprise, no doubt, in the minds of many of your readers, as in my own. I refer to the resolution for the discharge of the Messrs. Vivian from the management, which was effected, as it appears, in a somewhat treacherous manner. The proposer of the resolution obtained proxies to carry any resolution; but I much question whether the shareholders who gave the proxies intended that they should be used for such a purpose, as no notice had been given of it. And if I were a party concerned, I would have the subject brought forward at a special meeting convened for the purpose. So far as I can learn, there has been no fault in the management; and as Mr. W. C. Vivian held more than a sixth part of the shares, it was his interest to do the best he could to make the mine pay, and from the report it appears that such an event is probable. When that time comes all the credit will, of course, be given to the new agent! I like to see honest agents treated honourably; but in this case, as in South Condurrow, the Messrs. Vivian have been treated in a very different manner. They open up mines, and on the eve of their prosperity they are dismissed! The credit of the success at South Condurrow belongs to them, let people say what they will.—*Truro, Dec. 27.* OBSERVER.

SOUTH TOLCARNE, AND ITS MANAGEMENT.

SIR,—The references in last week's Journal to the proceedings at the recent South Tolcarne meeting are sufficient to create disgust in the minds of mine adventurers generally; and I can only hope that the next meeting will also be made special with a view to rescind the objectionable resolution, and to forthwith remove the management from an office in which such underhand proceedings are aided, for I am sure everyone must feel that where a secretary permits himself to be made the ready tool of one particular clique of shareholders he is unworthy to represent the whole body. It is, of course, possible that Mr. Hickey may have been no party to the movement, and that the discreditable work that was going on may have been unknown to him; but if this be so, he should for his own sake be anxious to set himself right with the shareholding public at once, more especially as both South Condurrow and South Tolcarne are under his secretaryship. I was intensely annoyed at your congratulations that "no Englishman was included in the majority" voting for the resolution, as you thereby infer that Scotchmen would have sanctioned it. As a Scotchman, and speaking for the majority of Scotchmen, I do not hesitate to say that this is false, and that as much—perhaps more—honourable feeling is to be found north of the Tweed as to the south of it. If you would trouble yourself to enquire you would find that Scotchmen are more heartily ashamed of the four, unhappily bearing the same name, whose votes were given at the South Tolcarne meeting than Englishmen could possibly be.

Fortunately I am not a shareholder either in South Condurrow or in South Tolcarne; but as I am a holder in more than one other mine managed in the same office I feel great interest in the matter, and should like it at once cleared up, as if this sort of business is not put a stop to I may find that the management of the mines in which I am interested has been without my knowledge removed to one of the most unapproachable of the Hebrides, and that a resolution has, moreover, been passed requiring that all correspondence with the board of management should be conducted in Gaelic, which would certainly not augment the marketable value of our property. Or, to take another case, I am a holder in Kingston Consols, many of the shareholders in which are Germans, living at Berlin. Now, I am glad to say that this mine is not managed in the same office, or I might find that the board of management had resolved to sit at Berlin, and that the company's registered office in London, though retained in name to comply with the Companies Act, would be reduced to a mere cipher.

Whether it was desirable to dispense with the services of Messrs. Vivian as managers, and Capt. Paull as sub-manager, is a question upon which I cannot offer an opinion, though I think there is something in the Cornish saying that "a good mine makes a good captain," and I have seen nothing to lead me to infer that either Capt. Vivian or Captain Paull have been at fault in their management. But, admitting that their removal was desirable, that neither of them know a lode when they see it, and that their connection with the company was prejudicial to the shareholders, I would have turned them out openly, instead of resorting to secret operations, which can have no other effect than to extinguish whatever confidence may have existed in the management. I think, too, that Mr. Charles Clark—whom I hope is not a Scotchman, so that it may be said that one Englishman was mixed up in the affair—should explain what part he played in the matter, and that Mr. Crawshay should distinctly state whether he was aware that the objectionable resolution was to be brought forward. There is one more reason why the matter should be cleared up. At present Messrs. Vivian and Captain Paull occupy the position of martyrs, and I do not like martyrs, because they always get more sympathy than they are entitled to. Let it be shown that they are incompetent, and then the resolution of the last meeting having been rescinded let them be turned out in a proper way.—*Dec. 27.* A LONDON SCOTCHMAN.

GOLD IN COLORADO.

SIR,—I have sent you some samples of gold ores that came from mines which have been abandoned for the last ten years—ever since the first discovery of silver in Clear Creek county; but owing to the great fall in silver the mines are again producing considerable quantities of gold. The surface of the lodes are about 25 ft. from one wall to the other, and carry considerable free gold, which you can see by one of the pieces. The surface quartz runs from 50 to 80 ft. in depth; then comes the iron, of which the pieces I send you are a very fair average of a large lode. These lodes are situated in Upper Union mining district, about 5 miles from Georgetown; they are not worked to any great extent, for there is nothing here to treat the iron. The gold at present comes from the surface working, which is run through stamp mills, where they save about 70 per cent. of the gold. I think if there was some kind of process here to treat the iron we should have some of the best paying gold mines in this great western country.

I think the specimens I forward will produce gold, silver, and copper. The iron can be got out of the mine for about $4 per ton, and plenty of it. Gentlemen coming here seeking mining property have been so much struck after silver that they have overlooked the best mines for investing money in. All that is needed here is something that will treat from 50 to 100 tons of iron every 24 hours. I see in the Journal, dated July 1, an article in regard to the management of the Caribou Mine by Dutchmen. I must say that the Germans have not proved themselves much at mining, but they are great hands for building large mills, which can be seen all the way from Denver to Georgetown—nothing but monuments of incompetent management; and the Americans are, indeed, even worse, for they cannot work a mine over 100 ft. deep; if they do, the longer they work the less men they can hire, and if the mines lay idle for a few months they cave in. This country is different to England, for there the rich men own the mines, and here the poor men own them. The latter are by far the best for companies to deal with—the "professionals" too frequently deal with poor men here, and get their lodes for next to nothing, then go and sell them to companies for a large sum. I could send you some richer pieces, but these are a fair average of the lodes. DANIEL ROBERTS.

Georgetown, Clear Creek Co., Colorado.

THE RICHMOND MINING COMPANY.

SIR,—Being a large shareholder in the Richmond Mine, and, therefore, deeply interested in all matters connected therewith, I am much disconcerted and puzzled to think how it is that the shares should, ever since the last annual meeting, have persistently and steadily declined. It surely cannot be through any shortcomings of the mine, for the accounts from over the water are as good, if not better, than can possibly be expected by anyone acquainted with "the glorious uncertainties of mining," neither can it be in consequence of a decline in the weekly out-turn of bullion by the furnaces, which from Sept. 1 up to Dec. 18 had, I find, reached the very satisfactory sum of $774.000, or 154,800*l.*, whereof, if we assume the net profit to be 18½ per cent. only (a percentage obtained from the average results of all former years, and after duly deducting the 20,000*l.* which had to be struck off from the reserve fund this year), we may set down 28,251*l.* as clear profit, although I know that this is far below the mark, for our directors informed us in November that the net profits for September and October alone had been ascertained to be 20,000*l.* out of a gross out-turn of 84,200*l.*, or at the rate of nearly 25 per cent.

Now, if by Dec. 18 we had made, even at my rate of calculation, 28,251*l.*, we may reasonably expect to turn out by Feb. 1, at the same average rate of working, 116 000*l.* worth of bullion, and a net profit of 21,170*l.*, which, added to the above 28,251*l.* and 8000*l.* which was at our credit on Aug. 31, makes an aggregate of 57,421*l.*, from which, if the 20,250*l.* paid away in dividends on Nov. 8 be deducted, there will remain a sum of 37,170*l.* available for a dividend of 7s. 6d. in February, and leave 11,920*l.* to carry forward. But not only have we these immediate profits in view, but there are the magnificent developments which are weekly reported — developments which only those who, like myself, clearly follow the history of the mine can properly appreciate—but which, nevertheless, every shareholder would do well to make himself acquainted with before he parts with his shares at the present forced, panic prices; and it is with a view to assuring the timid, and enlightening the ignorant, that I have now taken up my pen.

The reserves laid bare are simply enormous, and may, without the smallest exaggeration, be set down at close upon a million sterling. Besides this we have the following brilliant prospects before us in the coming year:—

1.—A saving of 10,000*l.* yearly owing to the new contract rates in haulage of ore from mine to the works.

2.—A large possible saving in the cheaper rate at which coke may be obtained—a question which should not be lost sight of, and one which all shareholders should press upon the directors, seeing it relates to a saving of from 20,000*l.* to 25,000*l.* annually.

3.—The probable large saving in the cost of labour by a reduction in the miners' wages from $4 to $3½.

4.—The saving by being no longer in debt to the bullion agent, and of 1520*l.* through borrowing money on 10 per cent. debentures in lieu of at 14 per cent. from the bullion agent.

5.—The cheaper working of the mine by improved machinery of sorts.

6.—The larger and more certain out-turn of bullion by the furnaces, consequent on the erection ere long of a sixth furnace—a large hydrocycle. And finally, the savings to be effected by careful management in various other details, the enumeration of which would extend this letter to too great a length.

Taking all these facts into consideration it does certainly seem quite incomprehensible how the shares should now be quoted at 8¼ to 8¾, while in August last, when we were just getting our noses out of the water, and had not the brilliant prospects and sound position we now enjoy, they sold for 10½, ex div.

If someone connected with the company would kindly give any explanation of this anomaly, or you, by giving publicity to this, give courage to the wavering, and rouse the larger and more opulent of the company's shareholders to band themselves against the machinations of a party evidently bent on driving down the shares to as low a figure as they can, in order that they may get in at a cheap figure, he will be doing a service, and also greatly oblige—

Southampton, Dec. 28. AN OLD AND LARGE SHAREHOLDER.

[For remainder of Original Correspondence, see to-day's Journal.]

COOLING AIR IN MINES.—To overcome the difficulty and inconvenience of working in hot ends Mr. R. H. LUCAS, of San Francisco, has patented, through the Mining and Scientific Press Agency, an invention for dehydrating and refrigerating air, which relates, among other things, to the production of an atmosphere or a column of air of an exceedingly low temperature, which may be caused to displace the heated air in mines, to reduce the temperature so that mines can be worked in a more rapid manner and with greater comfort and safety. It is necessary first that the air should be cold, and secondly that it should be dry or free from moisture. The improvement in question provides for accomplishing both of these conditions simultaneously in a simple and effective manner. It consists in surrounding the pipes through which a refrigerant gas is conducted with any deliquescent salt, in combination with an air-forcing mechanism which will cause the air which is to be dehydrated and cooled, to come in contact with the salt. The inventor finds that by forcing the air to be cooled over and in contact with pipes which are surrounded by a deliquescent salt, such as chloride of sodium, chloride of calcium, caustic potash, magnesium, or other equivalent deliquescent substance, and through which a refrigerant gas is caused to flow, he can not only cool the air to an exceedingly low temperature, but also extract the moisture from it, so that it will be better adapted to breathing purposes. The action of the refrigerant gas within the pipes is to reduce the temperature of the air which is blown over them, while the deliquescent salt extracts the moisture from the air, leaving it dry and cold. As the deliquescent salt removes the moisture it gradually dissolves, and must, therefore, be replaced. In order to retain the salt in proper proportion around the pipes a netting or wire-gauze tube is constructed of larger diameter than the pipe, and this tube is supported by suitable means around the pipe. The space is then filled in between the pipes and the surrounding perforated gauze, with the deliquescent salt. Chloride of sodium—common salt—is the most convenient for this purpose.

FOREIGN MINING AND METALLURGY.

A severe winter may possibly give some stimulus to the Belgian coal trade. Whether this is the case or not there can be no doubt that business is at present in a somewhat languishing condition. The iron trade is consuming less and less coal, and this is, probably the great cause of the want of animation which is noticeable. Prices remain stationary; they could not well go lower, since for some time past very great concessions have been made to purchasers. The new Roubaix Canal will be opened for traffic on Jan. 1, 1877, but at present only boats drawing a maximum of 6 ft. of water will be enabled to enter France by this route. The profits realised in 1875-6 by the Belgian General Company for Lighting and Heating by Gas amounted in 1875-6 to 63,201*l.*, showing an increase of 6969*l.*, or rather more than 12 per cent, as compared with 1874-5. The Monceau Fontaine and Martinet Collieries Company will pay on Jan. 2 a dividend of 2*l.* per share for 1876.

Matters are, if anything, going from bad to worse in the French coal trade. The season which appeared likely at one time to be an ordinary one now seems likely to become an absolutely bad one. In presence of the general uncertainty attending business affairs, there is a general tendency to maintain an attitude of reserve, and to avoid large contracts. The warehouses are generally full, and in the Nord and the Pas-de-Calais coalowners appear disposed to take vigorous measures of reducing the extraction, and their current expenses; working miners will either be dismissed altogether, or their wages will be reduced. In the St. Etienne basin the situation is a little less trying, but it is, nevertheless, characterised by heaviness. Thus prices, which up to last week were pretty well sustained in the St. Etienne group, have now begun to fall. Upon the Paris coal market there is also very considerable depression, and the warehouses are generally full. During the last day or two, however, the weather has been colder, and this circumstance can scarcely fail to exert some influence upon the Parisian consumption of domestic qualities of coal.

The last few days have produced a very scanty budget of Belgian industrial intelligence. There has, in fact, been scarcely anything doing. The year closes indifferently from all points of view; orders have become more and more scarce, and prices have exhibited no tendency to revive. The Cockerill Company—which (and not the Sclessin Company) is the concern which is stated to have secured an order for rails, with delivery in London—has launched at Hoboken a screw steamer, named the Ville de Lille. The Ville de Lille is of 450 tons burthen, and her draught of water is 18 ft. 8 in. The Cockerill Company is completing the equipment of its Hoboken Works by constructing a dry dock, which will enable it to complete upon the spot any ships which it may undertake to build. A denial is given to an announcement made in the London Engineer that steam tramway carriages had been introduced at Brussels. Tenders are invited for about 12 miles of Bessemer steel rails for the Hamburg and Altona Tramway. A contract is also about to be let for 3430 tons of Bessemer steel rails for the Westphalian Railways.

A considerable amount of discussion has taken place in the French Superior Council of Commerce upon the warrant question. The Council decided by a majority of 22 to 9 to maintain the present *régime*—that is, the *régime* of Jan. 9, 1870, which imposes upon industrials the obligation of conveying to their works iron imported into France. As regards pig, the Council decided by 18 to 16 to leave the question free and open. Meanwhile, French metallurgical industry has exhibited a prolonged and persistent depression. Affairs have shown, in fact, less animation than ever, and the large railway companies have appeared less and less disposed to give out large orders.

Business in copper has presented little animation at Paris, and prices have been sustained with some difficulty. Chilian, in bars, has made 80*l.*; ditto, ordinary descriptions, 79*l.*; ditto, in ingots, 82*l.*; English, best selected, 83*l.*; and pure Corocoro minerals, 80*l.* per ton. Upon the German markets transactions have been confined to the strict requirements of consumption; prices have not, however, exhibited much variation. The Rotterdam tin market has been rather weak. Thus, Banca has fallen from 46 fls. to 45 fls., although at the last dates the market closed with buyers at the latter price, while several transactions to meet the requirements of consumption have been noted. As regards Billiton tin, prices have been maintained at Rotterdam at 44¼ fls. to 44½ fls., although business has been almost *nil*. At Paris prices have not sensibly varied. Banca, delivered at Havre or Paris, has made 83*l.*; Billiton, Straits, and Australian have made 81*l.*; and English, 80*l.* per ton. The German tin markets have been firm. French, Belgian, and German lead has been quoted at Paris at 22*l.* per ton. Upon the German lead markets there have been scarcely any variations. Silesian zinc, delivered at Havre, has brought 22*l.* 16s. per ton; other good marks, ditto, 22*l.* 16s. per ton; ditto, delivered at Paris, 23*l.* per ton. The Marseilles zinc market has remained without variation. The German zinc markets have ruled quiet.

TREATING LUBRICATING OILS.—Heretofore it has been necessary to mix hydro-carbon, or mineral lubricating oil, with a considerable proportion of fatty oils to give it the necessary body or viscidity, but these fatty oils (both animal and vegetable) are all more or less oxidisable in the air-producing gummy matter becoming very acid, and if left in warm places on cotton, wool, clothes, sawdust, or similar material are exceedingly liable to spontaneous combustion. For lubricating the piston of high-pressure compound surface condensing engines, both marine and stationary, the fatty oils are particularly objectionable, for in addition to the before-mentioned faults the high-pressure steam decomposes them into fatty acids and glycerine, which are, of course, carried into the boilers, where the fatty acids corrode most powerfully, and with the glycerine make a kind of soap-suds, producing excessive priming. But Mr. Humfrey, of Chester, claims that he is able to produce mineral, or hydro-carbon lubricating oil of such body that no mixture of fatty oils whatever is required, the viscidity being equal to the best olive, and considerably superior to sperm, while being perfectly neutral it cannot act on or corrrode the condensers or boilers, nor form concretions in the cavities of the pistons and steam passages, nor does it act on the india-rubber valves of the air-pump to any injurious extent when used for internal lubricating of steam-engines. For ordinary lubricating it is perfect, as it forms no gum or acid, and it is absolutely safe from spontaneous combustion, with a lubricating power equal to sperm. The oil treated by his invention is also specially suited for lubricating fast running machinery, and for all kinds of fast running mechanism. He first submits the oil to careful fractional distillation, and collects the heavy portion of the product. In the refining, or chemical treatment, instead of agitating the chemicals with the oil by means of paddles, screws, or other mechanical means as have heretofore been used, he forces a large stream of compressed air through a pipe at or near the bottom of the vessel, by which very important advantages are obtained. As well as a most thorough and complete agitation, a considerable effect is produced, powerfully aiding the action of the chemicals used, at the same time the great volume of air passing through carries off all traces of oils of low gravity and boiling points, the result being lubricating oil possessing more body, higher specific gravity and flash point than any mineral lubricating oils heretofore produced, making it specially adapted for lubricating the pistons, slide-valves, and other parts of the marine, locomotive, and other steam-engines, steam-hammers, and other apparatus. The oil may be produced from coal, shale, peat, bitumen, asphaltum, petroleum, and other oil-producers as is found most economical and convenient.

Meetings of Public Companies.

CHAPEL HOUSE COLLIERY.

A general meeting was held at the Colliery, Skelmersdale, on the 20th inst. A. G. BROOKES, Esq., in the chair.

Prior to the meeting the shareholders were conducted over the property and the underground workings by the manager, Mr. Loughran.

The Secretary read the notice convening the meeting, and the statement of accounts, and the following directors' and managers' reports were also read:—

We beg to submit our report on the company's transactions during the period which has elapsed since our last general meeting. Under ordinary circumstances a meeting would have been held at an earlier date; but it was hoped that by postponing it for a short time we should have been able to report that the seam of coal to which the new shafts are being sunk had been reached, and thus a fresh period in the career of the company might have been commenced under more favourable auspices. A slight accident to the machinery, however, caused some delay in the sinking, and has unfortunately precluded the possibility of reaching the seam referred to until after the end of the present year. Although the result of our working for the period now under review has not been as satisfactory as that which we had the pleasure to report to you last year, a little consideration of the causes which have operated against us, as against all colliery owners, will leave small small room for surprise that the present profit and loss account shows a smaller balance than the former one. The reaction from the high prices of coal in 1873 was, of course, anticipated; but it was impossible to foresee so great a depression as has been recently experienced, not only in the coal trade, but in general business. The amount of coal raised from April 1, 1875, to the date up to which our accounts are made, is 113,520 tons, and the colliery accounts show a profit averaging over 2s. per ton.

That this average is not larger arises solely from the causes above referred to, but an increased price has lately been obtained for coal, and the tendency of the market is decidedly in favour of a still further advance. Many excellent collieries have failed to yield any profits for some time past, and a rate of profit such as appears from our accounts is at present quite an exception to the rule. In fact, an extract from the manager's letter of April 6 last, which was circulated amongst you at the time, is as applicable now as it was then. Mr. Loughran wrote—"The shareholders should be well satisfied if they only look at the present state of trade, for we are working full time and making a good profit, and that is what nine-tenths of the collieries in this district cannot say. I am getting the best possible prices, and am putting out as much coal as is at present possible." In view, however of the condition of trade, and in consequence of the heavy outlay upon new works referred to below, it was deemed prudent to suspend the payment of dividends for a time: and unless a further large subscription is made for debentures at once in order to replace the profits already devoted to the prosecution of the new works, we cannot recommend the payment of a dividend at present. It is satisfactory to note that although trade has been so bad our manager has found it necessary to continue the purchases of large quantities of coal to supply the requirements of our customers, an evidence that we shall have a ready market for a largely increased output.

The company's prospects, therefore, even with its present output of coal (averaging 300 tons per day), are encouraging, but still greater encouragement will be found in the cheering prospect of the increased output to be looked for from the new pits now in course of sinking. The depth at which these pits are expected to reach the Park Mine is estimated at about 400 yards. The 16-ft. pit is now down 350 yards, and the 15-ft. pit is at present at a depth of 173½ yards. As regards the former, it was considered desirable to effect some alterations in the machinery in order to carry on the sinking with as much speed as possible, and good progress is now being made, the rate of sinking averaging about 7 yards per week. While making the alterations referred to it was necessary to temporarily suspend operations in the 15-ft. shaft, but they will be re-commenced at an early date, with the object of reaching the Park Mine with both shafts as early as possible.

When these shafts are completed a short time must elapse before the estimated output of 1000 tons per day can be obtained, but the result of this development will fully compensate for the time and expense involved in effecting it, for not only will the amount of profits be larger, but the profit per ton of coal will be increased, as the management and other expenses will not be materially altered, and will thus bear a smaller proportion to the cost of the output.

In addition to the larger profits which will accompany an increase in the output, it must be borne in mind that the superior quality of the coal obtainable from the Park Mine will yield an enhanced price. We have already reported the arrangements made for the postponement of the payment of two of the half-yearly instalments of the mortgage, and we are pleased to be able to state that the mortgagee is disposed to consult the interests of the company in every way in his power.

Under the arrangements referred to the next instalment of the mortgage will not become due until November, 1877, which leaves ample time for the completion of the new works. We cannot too strongly nor too often impress upon you the importance of providing the funds necessary to effect this object as speedily as possible. At present the profits do not, and until a decided further improvement takes place in the price of coal they will not, defray the expenditure on the new works, and unless additional subscriptions for debentures are shortly sent in the progress of these works must be so far modified as to reduce the rate of outlay upon them to the amount of current profits. Such a course cannot be too strongly deprecated, and the importance of a further and immediate accession to the debenture capital must, therefore, be apparent to all. It must be remembered that the original share capital of the company would if it had all been issued have provided fully for this expenditure on developments, and the debenture capital was issued in place of 8000 shares which were not taken up on the formation of the company. These 40,000*l.* of debentures, therefore, even if all were subscribed for, would not, with the shares issued, make up more than the total amount of capital originally contemplated. Up to the present time only 26,670*l.* of the debentures have been subscribed for, and it is hoped that the shareholders will do their best to take up the remainder. We continue to entertain a most favourable opinion of the value of the colliery, and we feel assured that if the policy hitherto kept in view—that of looking and laying the foundations of a permanently prosperous future be carried out, the property will yield large and increasing dividends, and afford satisfaction to all those interested in it. In accordance with clause 58 of the Articles of Association, A. G. Brookes, Esq., E. Harrison, Esq., C.B., and J. Romanes, Esq., retire from the board, and being eligible offer themselves for re-election. The auditors, Messrs. Johnstone, Cooper, Wintle, and Co., and Mr. G. H. Holt, also retire, and offer themselves for re election.

In presenting my report to you on the progress of the new works connected with the Chapel House Collieries, I have much pleasure in stating that since the last meeting the difficulty of the supply of water for the carrying on of the works has been overcome by the construction and completion of a very large reservoir having a surface area of about 3093 square yards, and a capacity of over 2,000,000 gallons of water. Since the last meeting the new 16-ft. shaft has been sunk a distance of of 250 yards, its present depth being 750 yards. The 15-ft. shaft has been sunk and bricked to 173½ yards; operations on the shaft have at present been suspended in consequence of the excessive cost and delay in sinking the 16-ft. shaft with the temporary engine. The new engines are now being utilised for the purpose of sinking the 16-ft. shaft to the Park Mine. In addition to the completion of the erection of the new chimney, engine house, new engines, and three two-flue boilers, two additional new two-flue boilers are being put down, and one more is now ready for delivery. About 1,250,000 bricks have been made, and clay turned out for all our requirements. The new winding head gear is now complete, and erected over the 15-ft. pit. The quantity of coal raised from April 1, 1875, to Sept. 30, 1876, is 113,528 tons, or 6307 tons average per month; the quantity of coal brought during the same period is 39,794 tons, or 2210 tons average per month. The colliery is now being worked full time, and about the usual quantity of coal being raised, but still I have not nearly sufficient to supply our orders, and am obliged to buy large quantities of coal. Prices of coal have advanced about 6d. per ton this month; I expect a further rise in price as winter advances. If I am supplied with a sufficiency of money to complete the works as I have laid them out, there will be no difficulty in raising 1000 to 1200 tons per day, in which case, regarding the profits now being made during a period of almost unprecedented depression, there can be no doubt that your colliery will make very large profits, and compare favourably with any other property of a similar character in the kingdom. —J. LOUGHRAN, manager.

The CHAIRMAN then said: Gentlemen, the notice convening the meeting having been read, I feel that some explanation is due to you why, in accordance with our custom, we have not issued the directors' report, together with the accounts, prior to the date of this meeting. The fact, however, is that the transactions and accounts of the company at Liverpool are of so numerous and voluminous a character that the Liverpool auditor was unable to complete the audit in time to circulate the balance-sheet before the meeting. Daily expecting the complete statement of accounts of the Liverpool books for the period which has elapsed since our last meeting, the directors delayed their report in order that the accounts might be incorporated with it in the same circular. In their report your board have fully explained why this meeting was not called at an earlier date. They believed that the new pit would have been completed to the Park Mine at a depth of 400 yards before the end of the year, but a slight accident to the engines, and the consequent delay in making repairs, &c., has caused us to be six weeks behind time. Finding quite recently that with all the energy of which your manager is capable the new pits could not be completed before the end of the year, your board deemed it advisable to call a meeting, so as to be in accordance with the rules of the Companies Acts. You have all now seen for yourselves what is the character of your property, and have, no doubt, formed an opinion on the subject somewhat similar to that entertained by your board—that we are possessed of a most valuable colliery, and one which will be a source of large profit for many years to come. But if there is one point which more than any other is calculated to convince you of this it is the satisfactory returns which have been made to you. You have heard the accounts read, and they are here for anyone who likes to peruse them, but to summarise them it is only necessary to state that the amount of coal raised at your colliery since our last meeting is 113,520 tons, which have yielded a gross profit of over 12,000*l.*, or, in fact, an average of over 2s. per ton. To this has to be added the balance of profit of 11,000*l.* from the last balance-sheet—in all 23,000*l.* Out of this there has been paid to you 10,611*l.* in dividends. The interest on the mortgage and debentures amount to 5,800*l.* Office expenses (including income tax 341*l.*), directors' fees, secretary's salary, office rent, and printing 2100*l.* After paying some other few and small items chargeable against the current accounts there remains 3569*l.*, which is surplus profit. I may mention that the principal items chargeable against capital are 21,799*l.*, which has been paid off the mortgage on the property, and the cost of our new works, which now stands at 20,468*l.* Having seen, as you have, the magnificent manner in which these new works are being carried out I think you will agree that this latter sum has been well spent. I hope also you will believe that the greatest amount of energy has been displayed in their erection; indeed, that the progress which has been made towards their completion may be taken as a proof that the importance of the future welfare of the company has not been lost sight of. The new engine is, we believe, second in size and strength to none in Lancashire. In the sinking of the pits we have cut several very valuable seams of coal, which have proved to be of greater thickness and better quality than had been anticipated, and I may mention that only this morning we have passed through another seam 11 feet thick, and containing about 7 feet of good coal, but the great wealth of our property lies in the "Park" and deeper mines which we shall now shortly be opening out. As I stated just now the average rate of profit realised is over 2s. per ton, a rate, we believe, during the depression of trade which is, if not unequalled, at least unsurpassed. I think, therefore, you will see cause for considerable satisfaction that we have been able to gain so fair a rate of profit. When the new plant is completed we shall, we anticipate, be raising about 1000 tons per day, which, if the present rate of profit be maintained, will yield an annual return of 30,000*l.* I may mention that the coal which we shall obtain from the deeper measures is worth in the market from 1s. to 2s. per ton more than that we are now working, and this difference in price, if it does not yield a proportionate additional gain, should at least prove a handsome margin to provide against any reduction in the present very satisfactory rate of profit. With regard to the mortgage, it will no doubt be remembered that it was arranged that we should pay the balance at the rate of 10,000*l.* per annum until the whole should become liquidated. The mortgagee has, however, agreed to a postponement of any further payments until November next, by which time we shall have our new plant in full working order, and be in course of realising greatly increased profits. The mortgagee has now intimated, that provided we pay him a good round sum (say 10,000*l.*), he will agree to postpone all further payments indefinitely. In fact, to permit the liquidation of the balance of the mortgage to be effected at our convenience. This would be so greatly to the advantage of the company that the directors cannot too strongly urge upon you the desirability of subscribing for the unissued debentures, and they hope that each shareholder will see the advisability of assisting to the utmost extent in his power. I will once more refer to the fact that we have a balance of undivided profit amounting to 3569*l.*, which is clearly applicable to the payment of dividends, and on this subject we shall be glad to have the views of the shareholders. It is, however, the opinion of the board that in view of the present large expenditure which is being made on the new works, and also of the desirability of reducing the amount of the mortgage, it is hardly advisable to appropriate this balance of undivided profit to the payment of a dividend. I will now move that the directors' and managers' reports, together with the statements of accounts, be received and adopted.

Mr. SWALLOW asked what difference there was between the amount of coal raised and the amount sold?—Mr. THOMPSON (a director) explained that the sales were much larger than the raisings on account of the quantity of coal purchased.

Mr. SWALLOW knew that, but what he wanted to know was what quantity of the coal raised actually reached the market?

Mr. LOUGHRAN (the manager) said that the consumption of coal on the works for engines, brickmaking, and all other purposes was about 400 to 500 tons per month, and this would represent the difference between the raisings and the sales.

Mr. THOMPSON added that the old machinery used a great deal of coal, but that when the new machinery now in course of construction was completed the consumption of coal on the works would be very considerably reduced.

Mr. MOORE then seconded the resolution before the meeting, which was carried

Mr. HARRISON moved the re-election of the Chairman, speaking in warm terms of the services rendered by Mr. Brookes.—Mr. HUMPHREYS seconded the motion, which was carried unanimously.

The CHAIRMAN then proposed, and Mr. C. H. JONES seconded, the re-election of Mr. E. Harrison, which was carried unanimously.

Mr. LETHBRIDGE moved the re-election of Mr. Romanes.—Mr. THOMPSON was pleased to second the resolution. Mr. Romanes had been one of the most hard working of the directors, and had assisted the company immensely by placing debentures amongst his friends, who were in fact, next to the directors, the largest debenture holders.

Mr. BARDSLEY suggested that the management should be more in local hands. The board ought to contain men known in the district.

Mr. THOMPSON said that several of the directors now on the board resided in the North of England, and as one of them was constantly visiting the property the management was under quite sufficient supervision.

Mr. SWALLOW said he was perfectly satisfied with the present directors, and the retiring ones might just as well have been put up and re-elected all together.

The motion for the re-election of Mr. Romanes was then put and carried unanimously. The auditors, Messrs. Johnstone, Cooper, Wintle, and Co., of London, and Mr. G. E. Holt, of Liverpool, were then re-appointed

Mr. PENNINGTON moved a cordial vote of thanks to the Chairman and directors. He thought great praise was due to them for management which had resulted in such a satisfactory rate of profit; and the energy which had been displayed in carrying on the new works, and in the manner in which this was being done, showed that the company's affairs were studiously looked after.—Mr. CHILLCOT seconded the motion, which was carried unanimously.

The CHAIRMAN said he and his co-directors thoroughly appreciated the kindly way in which their efforts were recognised. They had done their best for the benefit of the company, and he felt sure that, supported as they were by the shareholders, they would succeed in making the company one of the most successful before the public.

A SHAREHOLDER moved a vote of thanks to the manager and secretary, which was seconded by Mr. MOORE, who said that the success of the company must greatly depend upon the way in which it was served by its officers, and this company was especially fortunate in having such good servants.

This resolution having been carried unanimously, the meeting terminated.

NANT-Y-GLO AND BLAINA IRONWORKS COMPANY.

The half-yearly meeting of shareholders was held at Manchester on Thursday—Mr. HUGH MASON in the chair. The meeting has been repeatedly postponed pending a valuation of the works and stocks, upon which Mr. Rodford, C.E., has been engaged for many weeks past. The report presented on Thursday was for the half-year ending Aug. 31. It stated that the loss on the year of 63,218*l.* was accounted for partly by depreciation in the value of stocks, partly from the extremely bad trade, which had caused a serious fall in the selling prices of coal and iron, and partly through an incorrect and exaggerated return made last year as to the stock of small coal. In consequence of the failure of the trade in iron rails the ironworks of the company had been closed. The directors had deferred the last half-year's payment of interest on the debenture stock. They felt that they must pay their way to their workmen, their tradesmen, and their mortgagees; and as the debenture-holders were all their own shareholders, they felt it to be only right that they should wait a while, in order that all the creditors' demands should be honourably met. The debentures, however, were amply covered by security. The report concluded as follows:—

"The important question arises—What is to be the future of our company? A little stir in the iron and coal trade would quickly enable us to place the coal production in a condition of profitable sale. The highest authorities in South Wales have stated that the trade in iron rails has gone never to return. A moderate outlay of capital would enable us to lay down plant for the manufacture of steel rails, which will certainly be the great trade in time to come. We are preparing to vastly develope our extensive and valuable coal field by sub-letting large tracts of coal, from which we shall immediately receive a considerable addition to our permanent income from royalties. There remains to be raised at least 60,000,000 tons of first-class coal, and we see no reason why we and our lessees should not shortly be sending to the market 1,500,000 tons per year. The increase in coal production will increase our safe income from tolls on our railway, and we may here state that one of the great railway companies has already entered upon preliminary negociations for the purchase of our private lines. If we sell the railway we must not let it pass out of our hands except at its full value, which is very considerable. Our present income from tolls over our own railway is at the rate of 3850*l.* per year, as against 1284*l.* in the year ended August 31, 1876. Of course the tolls will go on increasing gradually with the output of coal. Our income from royalties will in like manner largely increase. We are now effecting great economies throughout the pits and works, and taking all things into consideration we firmly believe there is a profitable future before us."

The CHAIRMAN, in moving that the report of the directors be received, expressed his satisfaction that the Chancery suit of the company against Mr. James Carlton and Mr. Albert Grant, which had now for three years been pending, had been fixed for hearing on Jan. 23, and he was confident of a successful result. He took credit to the directors for reducing the general charges and commissions from 18,986*l.* in 1873 to 6322*l.* in the last year. He also stated that further economies were being made in other departments. He advised the shareholders to have faith and patience, and not to throw away their property in the present depressed state of the market. If they held on they would be rewarded in the end. He stated that in a few weeks another meeting would be held to consider a report as to the future working of the company, which was at present under the consideration of the directors.—Mr. ISAACSON seconded the motion, which, after some conversation, was adopted unanimously.

GREAT WHEAL VOR UNITED MINES.

The quarterly general meeting of adventurers was held at the offices, Gresham House, Old Broad-street, on Thursday,

Mr. J. O. HANSON in the chair.

Mr. J. JAMESON TRURAN (the secretary) read the notice calling the meeting.

The report of the directors, the report of Capt. Harris, and a letter from Capt. Harris, were also read, as follows:—

The committee beg to report that since the quarterly meeting of adventurers, held in September, the lode has been cut underneath the cross-course between the 90 and 100, or at about the point calculated by the agents in forming their expectations of this result many months since. The committee, however, much regret to state that the lode was found unproductive, or at all events not sufficiently productive to offer much encouragement for future development at the present low price of tin. It is, however, but fair to state that for the short distance it has been opened upon the explorations show indications of improvement. It was hoped more might have been seen of it before the present meeting, but unfortunately during the recent heavy rains a flood occurred, filling the mine up to nearly the adit level, and endangering the lives of the men who were then at work, and consequently this delay has retarded the progress which might otherwise have been made. Under these circumstances, in order to give every shareholder an opportunity of expressing his opinion either personally or by proxy, the committee would suggest that this meeting be adjourned for a month for the purpose of hearing what further development has taken place, and considering what steps may be necessary in the future, and they propose before that meeting is held to have the mines inspected and reported on by a competent authority for the information of the shareholders, as by that time they will have the opportunity of being better able to judge how the lode is likely to turn out, the more so as if the mines are to be carried on, and the lode continues as unproductive as at present, further calls will be absolutely necessary to meet expenses. The shareholders will bear in mind that the cutting of this lode has been the point aimed at during the last two years, and this being effected, it is for them to determine the future course of proceedings.

The financial state of the company is as follows:—

Balance in hand on Oct. 30		£ 542	15 1
Received on account of call made September, 1875		11	10 8
" " June, 1876		154	19 0
" Tin sale, Nov. 2, 1876		90	15 6
" " Nov. 30		46	11 5
" " Dec. 23		32	2 6
" Sundries from the mines		12	3 11
Total		£ 888	18 1
And paid—Labour pay to Oct. 7, 1876	£180 13 3		
" Nov. 4	184 12 1		
Sundries, postage, &c.	4 13 4=	369	18 8
Balance		£ 518	19 5
The actual account stands this day as follows:—			
LIABILITIES—Merchants' bills		£1963	5 1
Lords' dues		34	10 10
Labour pay, due Dec. 29		167	17 9
Salaries, &c., three months		61	0 0
Total		£2325	13 8
ASSETS—Balance as above	£518 19 5		
Arrears of calls	165 5 0=	684	4 5
Balance against the mines		£1541	9 3

And to pay off the more pressing liabilities a call of 2s. 6d. per share is necessary. A resolution to that effect will be submitted for your approval.

Dec. 27.—I have been underground all the morning with the men that have been at work in the 100; the lode is more kindly, much so, than when we commenced to drive from the end of the shaft. We have driven east 10 ft., and about another 10 ft. from the end of the shaft back to the cross-course, so that we have seen the lode for 3 fms. 2 ft. long, which is but a small trial after spending so much money to get down to this point. I hope the committee will think favourably of our prospects, and continue the operations east if they should decline sinking the shaft deeper for the present. The cost of continuing the 100 alone would not be great, and I feel the prospects of the lode in the present end warrant it. I may say that I brought up the best sample to day that I have seen, still we have not tin enough to pay for returning at the present low price of tin; but, as I have named in the short report herewith enclosed, that a little improvement would put us right.—S. HARRIS.

Dec. 27.—I beg to submit to you the following report for the quarterly meeting. During the past quarter we have sunk West Metal engine-shaft to the 100 fm. level, at which point we intersected the lode east of the cross-course; when first seen close to the cross-course it was about 1 ft. wide, and not productive, but by opening on its course east it has been gradually improving both in size and productiveness, and in the present end it is 2½ ft. wide, with tin disseminated throughout. I have assayed various samples from it the last few days that produced from 10 to 14 lbs. of tin per ton of stuff, which is very encouraging, and from the nature and appearance of both lode and ground I am of opinion by extending east from the influence of the cross-course tin will be met with in paying quantities; the ground is easy for development, so that good progress could be made in extending the 100 east towards the tin ground we know to exists west of Edward's shaft. I think our prospects in this direction are very good. Although we have a great increase of water since we intersected the lode, we have ample engine-power and pitwork in good condition, so that we have no difficulty in keeping the water, and having all the necessary stamping and dressing appliances, a little improvement in the quality of the lode would enable us to meet the cost of working the mine.—S. HARRIS.

The CHAIRMAN said: I am extremely sorry it has not been in the power of the committee, or of Capt. Harris, to present you with more favourable reports. As you are aware we have reached the point that has been so long aimed at—the lode under the cross-cut, which it was expected we should see at about the 100 fathom level; that expectation has been so far carried out at about 98 fms. below the surface, but unfortunately the lode has been cut unproductive, and at first there was scarcely a trace of tin in it. Owing to the recent heavy rains very little has been seen of the lode up to the present time, but what has been seen shows apparently indications of improvement. No doubt the shareholders will very seriously take into their consideration whether it will be prudent or not to continue the operations of the mine, inasmuch as calls will be absolutely required, and we all know personally how very unpleasant it is for the committee to make calls, and for the shareholders to receive notice of them. Capt. Harris in his letter this morning seems to hope that by a further development the lode may improve; if it does we shall be able to pay the cost, and to go on in the hope of better times. Therefore, the shareholders must determine (for it really is a shareholders' question) how far they will be prepared to go on and support the committee in future. In order to give time for further explorations, acting under the advice of Mr. Childs, our solicitor, we think it will be advisable to adjourn the meeting for another month, and then we shall see more of the lode, and shall be better prepared to state what, in our opinion, will be the course for the shareholders to pursue. If any shareholder has any question to ask, the committee will be happy to give all the information in their power.

The CHAIRMAN, in answer to Mr. Forsyth, said that the 2s. 6d. call would carry them on about six weeks, but before that date the adjourned meeting would be held, and the directors would be, he hoped, able to place before the shareholders information which would enable them to decide whether or not it was worth while continuing the working of the mine. If they stopped and wound-up now a call of 2s. 6d. would be necessary to meet the liabilities, though of course, if when the machinery came to be realised there might be some small surplus to return to the shareholders.

Mr. MARSDEN said that having cut the lode it certainly would not be business-like to abandon the mine till they had tried the lode.

A short discussion ensued, the general opinion being that it would be better to make the call, to go on with the working of the mine, and see by the adjourned meeting whether the mine was improving.

The CHAIRMAN then moved the adoption of the report and accounts, which was put and carried. A call of 2s. 6d. per share was then authorised.

It was then resolved to adjourn the meeting for a month, by which time it is believed the newly-cut lode will be sufficiently explored to ascertain its worth.

GOVERNOR AND COMPANY OF COPPER MINERS IN ENGLAND.—A meeting of the shareholders was held on Wednesday, at the request of Mr. John Young, the official liquidator, at the Cannon-street Hotel, to consider an offer which had been received from Messrs. Shaw and Thomson, of Leadenhall-street, for the whole assets and property of the company. It may be remembered that this concern went into liquidation last July. It had existed since 1691, when it was incorporated by royal charter. The losses during the last few years have been enormous, and even now, in the liquidator's hands, the works are losing at the rate of 26,000*l.* a year. The offer submitted to the meeting by Mr. Young, on behalf of Messrs. Shaw and Thomson, was—first, to pay the whole debts of the company, amounting to 40,000*l.*; second, to pay the costs of liquidation; and third, to pay the preference shareholders 3*l.* per share, equivalent to a fur-

ther sum of 35,000*l.* The offer, having been discussed, was in the end declined, and the liquidator instructed to keep the concern going, and reduce as much as possible the expenses.

For remainder of Meetings see to-day's Journal.]

GOLD IN WALES—SPECIAL REPORT ON THE CLOGAU MINE, BONTDDU, DOLGELLEY.

Dec. 3.—During the past week there has been driven in the Vigra adit 11 ft. 6 in.; total distance driven for the four weeks ending Dec. 2, 14 yards 6 in. Present distance from mouth of adit to the end is 349 yards 2 ft. 6 in. In the end at present there is a hard band of pyritous slate, which has somewhat retarded the progress of driving. We expect soon to be through this and in better ground. No. 1 stope has been very variable during the month, it has given some small but very rich bunches of visible gold. We are near in the greenstone, but cannot say the exact distance; from the appearance of the lode we must be very near it. The greatest bulk of the bar of gold sent came from this stope. The end driving east of No. 4 shaft is improved, but at present shows neither visible gold or bismuth. The object in driving this end is to meet the bottom, or St. David's greenstone, which is dipping towards it. The stope in bottom of No. 5 shaft we were obliged to stop, the sides getting so heavy from the number of false walls, both on the hanging and foot, which made it very dangerous to work. In the winze, bottom of No. 5, the lode is small, but shows occasionally a little bismuth. The winze sinking west of No. 5 shaft, in the 5 fm. level, has given visible gold during the week, especially the last two days, and we expect this will be one of our principal stations for the present month. We have made arrangements to set on Monday a new winze, which we shall call No. 7, we shall commence sinking it at the cross-cut, a little east of No. 3 shaft, in the bottom of main adit level. About 9 ft. of this will be sunk in the poor white floor quartz, which overlies the rich ground we have had in No. 1 stope. It will also be opening out all the ground east of No. 4 shaft, and will in time become one of the most important parts of the mine. The timber has been purchased for the timbering of the mine. As the stamps are not ready to begin treating the stuff that is raised, and it is impossible to store any more on the dump, in the meantime we shall direct all our energies to open out the mine by sinking and driving.

REDUCTION WORKS.—The stamps shed has been cleared of the Mosheimer pans, the blankets and triangular strakes, and everything made ready to receive the percussion tables. The stamps have been fitted with seven new heads, and the old iron bottoms have been planed down and again fitted in their places ready to receive the loose anvils, which we received to-day. New grate frames have been put in, and the old lifter guides taken away and replaced by new ones. The carpenters are now engaged on the percussion tables and classifiers. Strakes, fitted with rough boards, have been placed to treat all the waste from the percussion tables. The Brittan pans have worked during the week, and the amount of amalgam obtained from the quartz containing visible gold, broke in the mine up to Nov. 30, is 331 ozs., which gave a bar of gold weighing 74 ozs. 2 dwts. The amalgamation results are as follows:— Rich quartz: 270½ lbs. gave 316¾ ozs. of amalgam.
Poor quartz: 421 lbs. gave 14¼ ozs. of amalgam.
The results obtained from the separate parcels of rich ore treated are as under:—

Parcel No. 1,	147 lbs.	of ore, gave	130½	ozs. of amalgam.
,, 2,	74	,,	36½	,,
,, 3,	25	,,	69	,,
,, 4,	24½	,,	80½	,,

All the amalgam was very hard and good. The tailings are all saved, and will be re-treated. We have carefully saved all the black scum and coarse stuff found in the residue top of the mercury after tapping, and treated it separately, and have found that it contains all the gold too coarse for amalgam. We have got now 8½ ozs. of amalgam from this, and 6¼ ozs. from the amalgam left sticking to the balls and the pans, so there is still left 15 ozs. of amalgam ready for retorting, which belongs to the bar of gold we have sent off. The gold obtained from this shall be sent on Monday. We have lost time in waiting for timber, but we have got now, with the exception of the greenheart for the bottom of the tables, all we want, and we will try our utmost to have the two new tables by Christmas. The percussion tables I have seen and thought to purchase I have found to be not only badly geared, but far too light to do solid work. So far, and for your own good, I have, with the advice of Mr. Vickers, commenced making two new ones, which I hope will be finished and ready to start by the first day of the new year.

EZEKIEL WILLIAMSON, JOHN ROWE.

ASSHETON AND WEST ASSHETON.

The following special report upon these properties has been made by Mr. WALTER EDDY:—

December, 1876.—The sectional sketch accompanying this will show the relative position of these mines to each other better than words of mine can; and also the position of West Assheton to Tan-y-Bwich. The three mines form a line from east to west, are on the same lode in the same character of rock, are about 9 miles from Pwllheli, to which there is a capital road, and close to the sea shore, at which place there is accommodation for loading and unloading vessels. It will be observed that the three setts are rather short for Welsh mines—Assheton is about 265 fms. on the run of the lode, West Assheton 185 fms., and Tan-y-Bwich, as I was informed, from 200 to 250 fms. I will notice each mine separately in the order I viewed them.

Assheton is the most easterly mine of the three, and has been worked on the east and west lode to a depth of 80 fms. below adit. Near the bottom the shaft passes through the lode, and it has been driven upon about 8 fms. to the east; for this distance it is from 3 to 4 ft. wide, mixed with a little lead and copper ores, but scarcely to value, the lode being very hard. At the 70 a short cross-cut was put out from the shaft and the lode cut, but it has only been driven upon a few yards, as it was rather poor. At the 60 the lode has been driven upon east 28 fms., and for 20 of this it maintains its full width, mixed with a little lead and copper ores, and a great deal of blende. From this point to the forebreast—8 fms.—the lode has greatly improved, and is of a very promising character. But little drivings have been made in the lode at the 50 from boundary shaft to the east. The 40 has been driven on the lode to communicate with the boundary, Brown's, and Mawr shafts, and between the two latter there is a capital course of ore being worked in the stopes from the 40 to the 50, and from whence the principal part of the ore raised in the mine has been got. The lode in the 50, east of Mawr shaft, is a great wide sparry one, with a large stream of water issuing from it, and containing some lead and copper, and in my judgment, is likely to lead to a good course of ore. I would advise this end being pushed forward to intersect the north and south lode, from which it is only distant from 13 to 14 fms.

North and South Lode in Assheton: The section with this shows the long drivings made upon this lode in the adit level. I examined these workings from the mouth of the adit by the sea shore to the end past Lindow's shaft; I could see, however, but little of the lode in the level, as it was worked away in the roof, and the bottom was covered with water. The lode where I could examine it is a large one, from 3 to 5 ft. wide, and from the workings upon it, above and below the adit, has evidently yielded a large quantity of ore; it throws the east and west lode a few yards out of its ordinary course, and is consequently of more recent formation. This lode can be proved in the deeper levels, at comparatively little cost, by driving on the east and west lode to intersect it, and I think this a capital trial. As stated before, the 50 is within 13 or 14 fms. of it, and as the two lodes do not meet at right angles, but obliquely, they ought to make a body of ore at and near the junction: it will be against general analogy in such cases if they do not. There are two pitches being worked on this lode (north and south) at the back of the 20, one at 7*l.* a ton for the lead, and the other at 4*l.* a ton for lead ore, and the same for copper.

West Assheton: The boundary shaft is a joint property, and divides the mine from Assheton. The mine is nearly all virgin ground from boundary shaft to Tan-y-Bwich, the surface not having been broken, and the little workings made below are merely a continuation of the levels from Assheton proper. At the 80 the end is 14 fms. in this ground; the lode here is wide (more than the width of the level), and was very hard and rather poor up to within a fathom or two of the forebreast; from there it is much improved, and the end is yielding good orey stuff. From the present indications I think a good rich lode will be met with shortly in this driving; the lode and country here are very similar to what they are in Tan-y-Bwich at the 90, but the lode is not so rich. At the 70 little has been done except cross-cutting through the lode from the shaft. At the 60 the lode has been driven upon into this ground 32 fms. from boundary shaft; the lode for nearly the whole distance was worth saving, but poorish; but for the last 2 or 3 fms. it has greatly improved. The orey part here has only been opened upon for 9 or 10 ft. in length, but for this distance the lode is rich. In the forebreast there is a large cavity or vugh full of fine cubes of lead ore, and from which comes a large stream of water; similar indications both in Tan-y-Bwich and Assheton were almost invariably the forerunners to a good course of ore. At the 40 the lode has been driven upon on this land about 5 fms., but at present it is rather poor in the end; there are men engaged stoping in the back here, close to the boundary, on a capital lode that will yield 3 tons to the fathom; but the bunch is very short. These are all the workings made at West Assheton, a summary of which I annex:—At the 80, 14 fms. driven towards Tan-y-Bwich; at the 70, 2 fms. driven towards Tan-y-Bwich; at the 60, 32 fms. driven towards Tan-y-Bwich; at the 40, 5 fms. driven towards Tan-y-Bwich.

Assheton: The mine is a little more than paying cost, and I can see no prospect of its doing more until fresh ground is opened out; there are several excellent trials that should be carried out, and which I have named in this report, and with good prospects of their proving successful. I am of opinion that the lode will improve in depth, as it was not productive in the upper levels. The dressing machinery is not very good nor modern, but I think the directors acted wisely in using their money for developing the mine below. Dressing apparatus can be erected when required by a larger yield of ore.

West Assheton is a fine piece of nearly virgin ground, and the little that has been done to prove the lode here looks most promising for future success. If I had money I do not know any two mines that I would sooner speculate in at a fair market price. But I look at both mines as having not yet passed the speculative points.

WEST GODOLPHIN TIN AND COPPER MINE.—This mine has during the past few months improved very materially, not only as regards its financial position but its further prospects, inasmuch as the main (caunter) lode is becoming much richer as depth is attained by sinking the pressure shaft, and Wilson's (east and west) lode is opening out more favourably than any other previously worked lode in the property. The former is worth for tin 40*l.* per fathom, and the latter has proved in the bottom level to be of great value for a length of some 60 to 70 fathoms; it varies in width from 3 to 25 feet, and its produce of tin from 10*l.* to 70*l.* worth per fathom. At the late general meeting the Chairman congratulated the shareholders on the improved prospects and appearances of the mine, and in explaining the financial position of the company alluded to the extensive additions that had lately been made to the plant, and the new machinery that had been purchased and erected. Although he did not propose a dividend he stated that many mines of Cornwall in a similar financial position would pay one, but he preferred, and advised his co-shareholders, to postpone the declarations of dividends till a suitable reserve fund had been accumulated to meet contingencies that might arise, such as, for instance, a breakage in the pumping, drawing, or stamping machinery, which might interrupt the working of the mine or the returning of the produce; of course, every precaution would be taken to avoid such a catastrophe, and a large stock of tinstone was being accumulated at surface to further ensure regular returns. The very favourable position of the property at the time these remarks were made has since been improved by a sale of tin realising over 1000*l.*, and by an increased value of the lodes, as reported by the manager: in addition to which a further sale of tin is to be made this week, in all probability exceeding the last, which was greater and realised a larger sum of money than any previously made by the company. In addition to the copper sold from West Godolphin during the present year the tin sales, including that of this week, will amount to nearly, if not quite, 200 tons, and although the price at which it has been sold has been exceptionally low the total produce of the mine for the year 1876 will have realised 9000*l.*

Registration of New Companies.

The following joint-stock companies have been duly registered:—

PROVIDENCIA AND NEW ROSARIO SILVER MINING COMPANY (Limited).—Capital 60,000*l.*, in 1*l.* shares. This appears to be a re-construction of the New Rosario Silver Mining Company (Limited), and the new company will acquire the whole of the property and effects of the old undertaking, according to the terms of an agreement made between James Goodson, Hill House, near Mitcham; H. Swaffield, of 5, Queen-street-place; and H. Sutton, liquidator of the vendor company. The property is situated in Mexico. The subscribers (who take one share each) are—James Goodson, 32, Kensington Gardens, gentleman; James Davis, 2, Harley Gardens, South Kensington, gentleman; James Eveleigh, Fairland, Sutton, gentleman; H. E. Nicolls, 27, Grafton-place, Eaton-square, gentleman; D. H. Goodsall, 34, Finsbury-square, surgeon; G. F. Laity, Warwick-road, Maida Hill, gentleman; H. Swaffield, 5, Queen-street-place, accountant. The directors are—Messrs. James Goodson, George Dawson, James Davis, John Tanner, E. Vernard, George Eveleigh, L. Wray, H. Sutton, G. F. Laity, D. H. Goodsall, and H. E. Nicolls.

BARLEY BROOK COAL AND CANNEL COMPANY (Limited).—Capital 20,000*l.*, in 5*l.* shares. To acquire the Barley Brook Colliery, Gillow-lane, Wigan. According to the terms of an agreement made between F. W. Dawson and W. H. Clemsha, the purchase consideration being 10,000*l.* The subscribers are—B. Smith, Priory Bank, Sale, near Manchester, glass stainer, 50; F. W. Dawson, Broughton, councillor, 50; John Darbyshire, Page Green, Wigan, colliery proprietor, 300; F. D. Hooper, Sale, pattern-card maker, 50; Lomas Coupe, Rochdale, colliery proprietor, 50; J. Smyth, Heywood, coal merchant, 50; W. Gregson, Bolton, coal merchant, 50. The directors are Messrs. B. Smith, John Currie, F. W. Dawson, J. Darbyshire, J. Smith, L. Coupe, and W. Gregson, the qualification being the holding of 50 shares.

CWM GELLY COLLIERY COMPANY (Limited).—Capital 12,000*l.*, in 6*l.* shares. To acquire the Cwm Gelly Colliery, parish of Bedwelty, Monmouthshire, according to the terms of an agreement made between D. Thomas, of Caerphilly, and H. Ames, of 3, West-street, Finsbury-circus. The first seven subscribers are—Thos. Casslett, Angel Inn, Caerphilley, Glamorgan, 5; D. Thomas, Caerphilly, colliery manager, 5; E. Edwards, Blackwood, Monmouth, ironmonger, 5; Walter Casslett, Caerphilly, coal miner, 5; H. Dodd, Caerphilly, coal miner, 5; E. George, Caerphilly, coal miner, 5. Mr. W. J. Sennett is to be the London manager of the company. The price paid for the property is 3000*l.* in cash and 4000*l.* in shares.

ANGLO-ARGENTINE TRAMWAYS COMPANY (Limited).—Capital 165,000*l.*, in 5*l.* shares. To obtain concessions for working tramways within the Argentine Confederation. The subscribers (who take one share each) are—Lord Alfred Paget, 56, Queen Anne-street; A. J. Lambert, 9, Craven Hill; W. George Penson, 6, Connaught-place, Hyde Park; A. W. Young, M.P., Berks; E. W. Ruck, Mayfield, Cheam; F. Esnouf, 1, Richmond-terrace, Barnsbury; H. W. Birks, 161, Brecknock-road.

FREEHOLD PROPERTY INVESTMENT GROUND RENTS SECURITIES ASSOCIATION (Limited).—Capital 100,000*l.*, in 5*l.* shares. To carry on business as a land company, &c. The subscribers (who take one share each) are—Alfred Boot, 7, Mark-lane; Robert Galton, 28, Alma-square, St. John's Wood; J. Brady, jun., Lloyd's; F. Cook, Lombard House, E.C.; E. G. Younger, 3, Adelphi-terrace, Strand; J. S. Wood, Three Crowns-square, Southwark; J. W. Duncan, 30, King-street, Cheapside.

GENERAL SANITARY WORKS COMPANY (Limited).—Capital 25,000*l.*, in 5*l.* shares. To carry out various sanitary improvements in connection with building, &c. The subscribers (who take one share each) are—R. H. Browne, Leith Villa, Reigate; R. Brudenell Carter, 69, Wimpole street; W. H. Corfield, 10, Bolton row; R. H. Howard, 1, Earle's Court-square; E. Johnson, 3, Castle-street, Holborn; L. H. O. Hamilton, 2, The Terrace, Earl's court; L. Maser, 12, Anglesea-place, Southampton.

FREEMAN, HARDY, AND WILLIS (Limited).—Capital 20,000*l.*, in 10*l.* shares. To take over a leather and boot and shoe manufacturer's business at Leicester.

UNITED LOAN AND DISCOUNT ASSOCIATION (Limited).—Capital 50,000*l.*, in 5*l.* shares. To acquire the business of Messrs. Uren and Co., of Birmingham, Wolverhampton, and Bristol, carrying on business as the United Loan and Discount Association. The subscribers (who take five share each) are—William Uren, Crofton House, Clifton; W. J. H. Trejise, Wolverhampton, 5; E. Holman, 5, Baker-street, Handsworth; S. Uren, 314, Green-lanes, Birmingham; Thos. Berry, Albert-road, Handsworth; D. M. Whittam, Victoria Cottage, Bedminster, Bristol; J. Uren, jun., The Willows, Handsworth.

JOTTINGS ON THE METALS—No. II.

By THOS. H. MILLER, Secretary of the Nascent Copper Company (Limited).

COPPER.

Kupfer (German), *Cuivre* (French), *Cuprum* (Latin).

BLACK COPPER.—Colour: between bluish and brownish black.

How occurring, and general appearance.—It occurs with other ores of copper, especially pyrites, malachite, and vitreous copper, and in mass, disseminated or investing, being composed of dull moderately cohering particles. It is friable, meagre to the feel, heavy, and slightly soils the fingers. Before the blowpipe it emits sulphurous odour, and melts into a slag that colours borax green.

RUBY COPPER of which there are three varieties—the capillary, the lamellar, and the compact.

1. *Capillary.*—Colour: light cochineal red. General appearance: small capillary crystals and thin flakes.

2. *Lamellar.*—Colour: dark cochineal red, inclining sometimes to lead grey.

How occurring, and general appearance.—It occurs in mass, disseminated, and crystallised in cubes and aluminiform octahedrons. The crystals are small, and for the most part laterally aggregated, their surfaces smooth and shining. When in mass it is usually opaque, or at most translucent on the edges. The crystals are transparent, verging into translucent. It gives a brownish brick-red streak, is moderately hard, brittle, and easily frangible; is found in veins principally in primitive mountains, accompanied by other ores of this metal. Fracture: foliated imperfectly, passing into granular uneven. Specific gravity, 3·95. Composition: copper, 88·5; oxygen, 11·5 = 100. Before the blowpipe it is readily reducible to a metallic bead without emitting either odour or smoke. Chemical peculiarity: it dissolves in nitrous acid with effervescence, and in the muriatic without.

TILE-RED COPPER, of which there are two varieties—the indurated and the earthy.

1. *Indurated.*—Colour: between hyacinth and brownish-red, passing on the one hand into lead grey, and on the other into reddish brown.

How occurring, and general appearance.—It occurs massive and disseminated in veins with ruby copper, malachite, copper pyrites, and iron ochre, and acquires a lustre by friction, and is moderately hard and brittle. Before the blowpipe it becomes black, and is infusible without addition, borax being tinged by it a dirty green.

2. *Earthy.*—Colour: hyacinth-red, passing into reddish or yellowish brown.

How occurring, and general appearance.—Its texture is between friable and solid, and occurs in mass, disseminating and investing copper pyrites. With these small exceptions this variety agrees with the preceding in its other characters.

MOUNTAIN BLUE, of which there are two varieties.

1. *Radiated.*—Colour: principally sky-blue, passing into Prussian and indigo.

How occurring, and general appearance.—It occurs in mass, disseminating or investing, more frequently botryoidal, stalactitic, and cellular, but most frequently crystallised in oblique rhomboidal or octahedral prisms, with dihedral summits. The crystals are generally very small, and aggregated into globular masses or bundles. The crystallised varieties are externally shining, but the rest are dull. Internally it is shining or glittering, with a lustre between vitreous and resinous. The crystals are translucent and semi-transparent, the other varieties are opaque, or at most translucent on the edges. When pulverised it is of a sky-blue colour, and is soft, brittle, and easily frangible. Fracture: straight, or divergingly radiated, rarely lamellar. Specific gravity, 3·2, 3·4. Before the blowpipe, with borax, it gives a bright green glass and metallic globule.

2. *Earthy.*—Colour: smalt blue.

How occurring, and general appearance.—It occurs in the newest primitive rocks, but more commonly in floetz mountains, in mass but rarely, being generally dessiminated, or superficially composed of fine pulverulent cohering dull particles; it is opaque, easily frangible, and slightly stains the fingers. It accompanies other ores of copper, especially malachite, grey copper, and copper pyrites. Fracture: fine grained earthy, passing into even or imperfectly conchoidal. Before the blowpipe it becomes black, but does not melt. In borax it melts with great ebullition, and forms glass.

MALACHITE, of which there are two varieties, the fibrous and the compact.

1. *Fibrous.*—Colour: grass green, passing into emerald, and sometimes dark leek green.

How occurring, and general appearance.—It seldom occurs massive or disseminated, but generally investing, and often crystallised in short capillary needles; disposed in diverged bundles or stars, for the most part translucent, externally shining but internally only glistening with a silky lustre. Fracture: delicate diverging, passing into coarse fibrous. Specific gravity, 3·5. Before the blowpipe it decrepitates and blackens, but is infusible. With borax it melts into a green glass. Composition: copper, 58; oxygen, 18; carbonic acid, 12·5; water, 11·5 = 100. Chemical peculiarities: With acid an effervescence, and on addition of ammonia a blue solution is formed.

2. *Compact.*—Colour: emerald, passing into grass and verdigris green, the same specimen exhibiting different shades of colour; its external surface is commonly overspread with a greenish-white crust. Fracture: conchoidal, or fine granular, uneven, or minutely fibrous.

How occurring, and general appearance.—It occurs massive and disseminated, but most frequently reniform, botryoidal, mammillated, stallactitic, or globular. Externally it is rough and dull, internally it is, according to the fracture, either dull, glistering, or shining; it is opaque, soft, brittle, and easily frangible, and generally is found in thin lamellar concentric distinct concretions, each of which has usually a different shade of colour. Specific gravity, 3·5 to 3·6. Chemical peculiarities, &c.: its chemical character and component parts are nearly the same as those of the preceding variety with which it also agrees as to its geognostic and geographical situation; its beautiful colour, lustre, and the high polish that it is capable of receiving render it much sought after for various ornamental purposes; it would, however, be much more esteemed if it were harder. Malachite exists in the newer primitive and floetz mountains, accompanied by other ores of copper, also by carbonate of lead, brown spar, and quartz, the finest specimens of the fibrous description being found in the Siberian and Hungarian mines.

MOUNTAIN GREEN.—Colour: verdigris, passing occasionally into emerald green and sky blue.

How occurring, and general appearance.—It occurs in mass, disseminated or investing. Internally it is shining, nearly glittering, with a resinous appearance, and is translucent and semi-transparent—is soft, and easily frangible. Fracture: small conchoidal. Chemical peculiarity: Little or no effervescence takes place during the dissolving by acids.

EMERALD COPPER.—Colour: emerald green.

How occurring, and general appearance.—It is shining, both externally and internally, has a vitreous lustre, and occurs crystallised in lengthened dodecahedrons. It is translucent, passing to semi-transparent, and scratches glass feebly and with difficulty, and is brittle. Before the blowpipe it is infusible, but turns to a chesnut brown colour. With borax it gives a bead of copper. Composition: vanquelin—oxide of copper, 25·57; carbonate of lime, 42·85; silex, 28·57 = 96·99.

MICACEOUS COPPER.—Colour: deep emerald, passing to verdigris green.

How occurring, and general appearance.—Externally smooth and shining, with a pearly lustre; translucent, passing into semi-transparent, being softer than calcic spar, occurring massive, disseminated, and crystallised in hexahedral tables in veins, accompanied by vitreous copper, copper pyrites, arsenical pyrites, and iron ochre. Fracture: foliated. Specific gravity, 2·54. Before the blowpipe it decripitates strongly. Composition: oxide of copper, 58; arsenic acid, 21; water, 21 = 100.

STONE-BREAKING MACHINES.

The principal feature of novelty and improvement in the stone-breaking machines invented by Messrs. KNIGHT, FARINAUX, and DUTEMPLE, of Lille, consists in arranging and combining together side by side a series of separate strong levers operating like shears to cut or split the pieces of stone that are to be broken, instead of employing hammers or other known means and instruments for effecting that object. In a suitable framing they arrange side by side two sets of levers, one set being placed opposite to the other set, each side being inclined so as to present a wide opening at the top to receive the pieces of stone, and a narrow opening at the bottom. Each set of levers is mounted on a separate horizontal axle, which passes through holes of corresponding size made in each of the separate levers of each series. These axles form the axes of motion of the said levers.

The upper and lower ends of each of the said levers is formed taper on its opposite edges, the taper edges constituting cutting edges, operating like shears employed to cut metal. The levers are corrugated on those parts of their edges which are between the plain tapered parts or cutting edges for securely holding the pieces of stone while they are being broken. Upon two strong horizontal shafts a metal tube, having cams or projections formed on its surface, is fixed, each cam corresponding to its respective lever at the back edge thereof and bottom ends of the said levers; rotary motion is imparted to the aforesaid shafts and cams by a system of toothed gearing driven by any convenient and suitable means.

In operating the machine the pieces of stone to be broken are placed in a hopper at the top of the machine fall between the innermost corrugated edges of the two sets of levers, and as the cams are caused to rotate the lower ends of the opposite sets and series of levers will be forcibly pressed, and approach each other, and effect the breaking or splitting of the stone that is between the corrugated edges of the several levers before mentioned, after which the pieces of stone thus broken will fall down, and be caught between the plain cutting edges of the several levers, and thus be finally cut and finished as desired. And they remark that an important feature in this invention consists—firstly, in combining in one machine the operations of two separate machines, and, secondly, by making each of the aforesaid levers with four separate cutting edges; when one cutting edge is worn, by turning each of the said levers upside down, or the back edge to the front, four new cutting edges may be brought into use, thus effecting great economy in the cost of machines of this description, as also economising power and space, and more effectually breaking the stone than has heretofore been accomplished by machines otherwise constructed.

MINING IN RUSSIA.—The Economiste Française states that the mean average production of iron in Russia is 320,000 tons. In 1874, the metallurgical establishments belonging to the State in the Ural Mountains, in the district of Olonetz, in the east and west of Poland, and in Southern Russia, produced 202,501 tons of cast-iron, 8994 tons of unwrought-iron, 1151 tons of steel, 8203 tons of war projectiles, 146 tons of steel for cannon, 241 tons of iron for cannon, 169 tons of armour-plate, 46,695 sabres and bayonets, 5735 muskets and locomotives weighing 177 tons. In the single district of Goroblogodatt, in the Ural Mountains, from 35,000 to 40,000 tons of iron ore are extracted every year, and since 1813 these mines have yielded 1,290,322 tons. The extraction is very easy, for many of the beds of ore are close to the surface and the quality is very good. The manufacture of steel is also making rapid progress, and several of the State establishments employ the Bessemer system, among others the cannon foundry at Obouchoff, near St. Petersburg. The great central market for iron in Russia is Nijni-Novogorod, to which the Ural mines alone send 100,000 tons every summer. The iron is sent down the rivers Bulaya, Kama, Volga, and Tchoussora in barges, and as the navigation is very dangerous, many of them are lost, especially on the Tchoussora. The iron sent to Nijni-Novogorod has to pass through three hands before it reaches the consumer, so that the price of it is very much enhanced. A great deal of the iron sold there is sent into the neighbouring districts and to St. Petersburg, while at Riga and Odessa it has against it the competition of foreign iron and of that sent from the State establishments of Tombof, Riazan, Vladimir, and Kalouga, which supply nearly all the south-eastern region. Further south, the unwrought-iron comes almost entirely from Laishef, in the province of Kasan.

HOBB'S HILL (St. Neot's).—It is stated upon good authority that operations will be resumed here as soon as the metal market improves. In consequence of its stagnant state the workings have been suspended, but the machinery is in excellent order, and the adventure is reckoned a very fair speculation.

DR. LOCOCK'S PULMONIC WAFERS—CURES OF BRONCHITIS AND VOICE, COUGH, CHEST, AND THROAT COMPLAINTS.—From Mr. Earle, M.P.S., 22, Market-place, Hull: "Your wafers are invaluable for the voice, throat, and chest. All sufferers from bronchitis, hacking cough, and deprivation of rest should take them." Sold by all druggists, at 1s. 1½d. and 2s. 9d.

RAYNOR'S TUNNELLING METHOD.

Fig. 1.

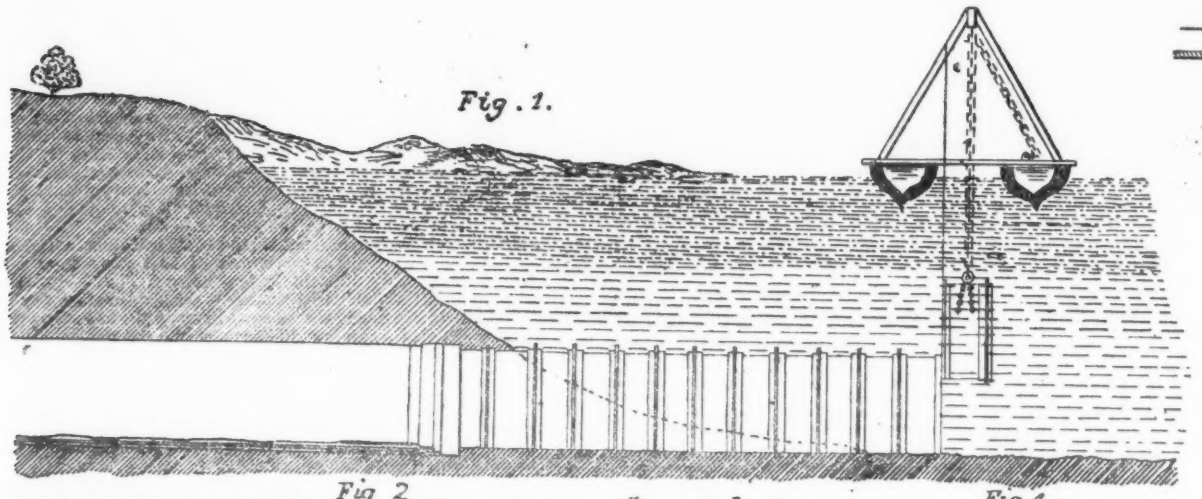


Fig 2

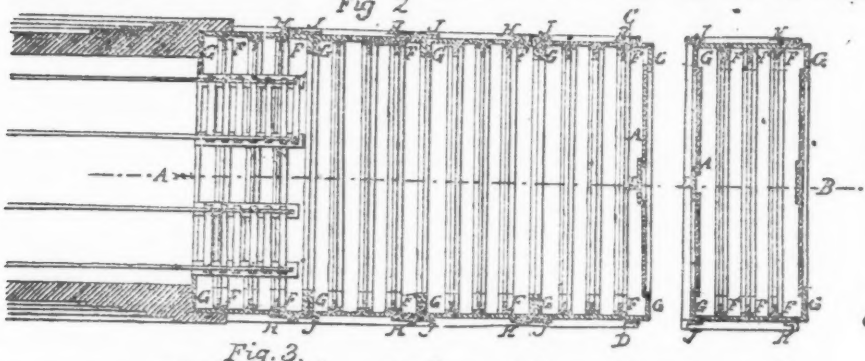


Fig. 4

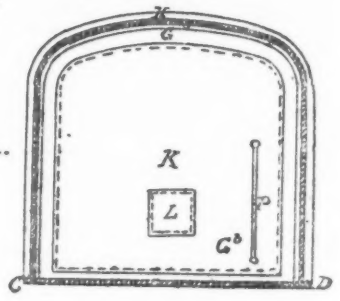


Fig. 5

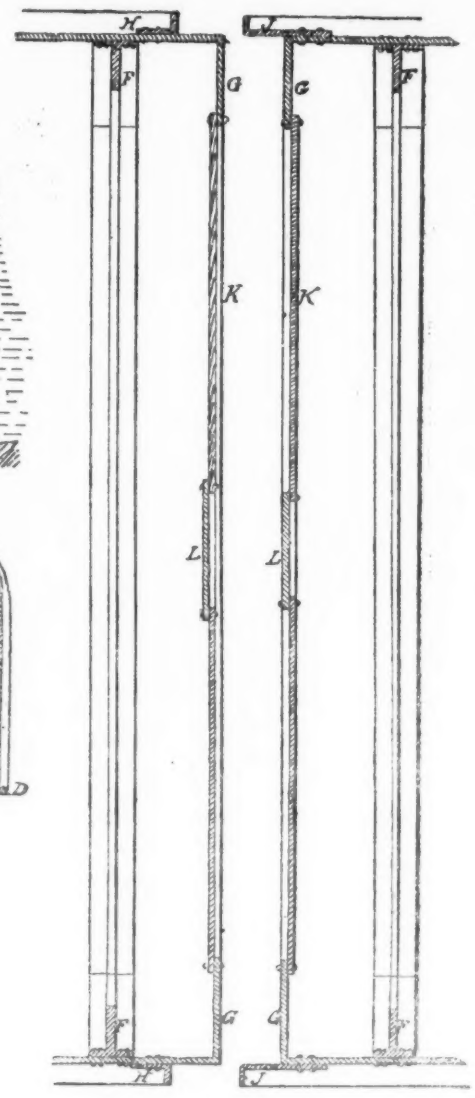


Fig. 3.

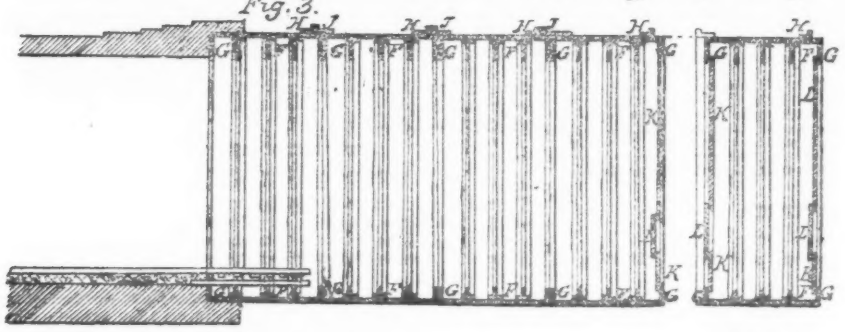


Fig. 7.

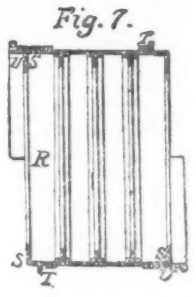


Fig. 6.

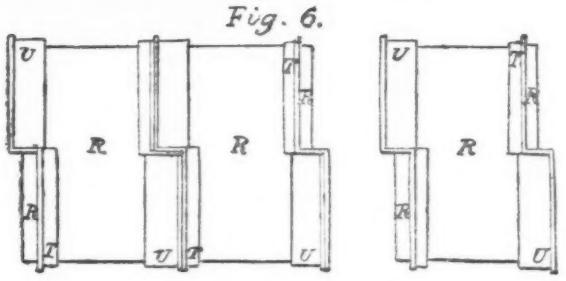


Fig. 8.

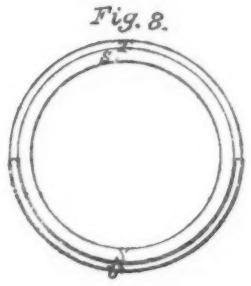


Fig. 9.

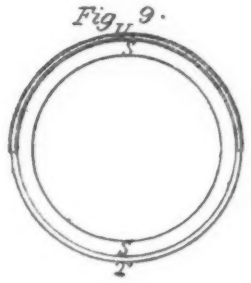
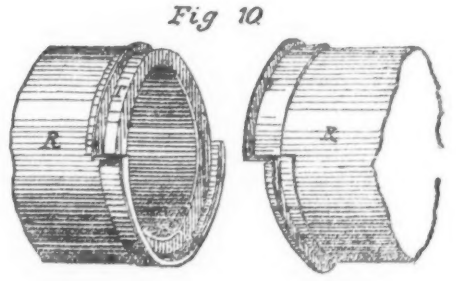


Fig 10



RAYNOR'S TUNNELLING METHOD.

We illustrate herewith a recently-patented method of constructing tubular tunnels, which is the invention of Mr. GEORGE RAYNOR, of South Hackney, Middlesex. The fundamental idea, as will be seen from our illustrations, consists in the construction of a tube of the full size of the intended tunnel, in short lengths, and lowering these sections one by one into courses excavated, or otherwise prepared for the purpose—in other words, the invention before us may be described as a substitute for the present laborious submarine tunnelling system in *terra firma*—and, as this latter subject is one closely allied to the miner's profession, we think we may appropriately give Mr. Raynor's plan due prominence in our columns.

Beginning with a description of our woodcuts, Fig. 1 gives a side view of a submarine tunnel in course of construction according to this new plan. Figs. 2 and 3 represent a horizontal and vertical section respectively of a portion of such a tunnel in plan and elevation, also showing the setting of a double set of lines for railway traffic purposes. Fig. 4 is a cross section on the line, C D; whilst Fig. 5 is a portion of a plan of the adjacent ends of two sections, drawn to a larger scale, so as to show more distinctly the arrangement of the flanges and the bulk-heads, or diaphragms, and manholes. Figs. 6 and 7 are side view and longitudinal sections of such a proposed tunnel, constructed of a cylindrical, or nearly cylindrical, tube—these woodcuts showing a variation in the arrangement of the flanges, which is recommended whenever the tunnel is of less width at its base than at some other higher point. Lastly, Figs. 8 and 9 are end views of the adjacent ends of contiguous sections.

Proceeding to details of construction, the forementioned tunnel sections are preferably made out of boiler-plates, rivetted together, and strengthened by internal flanges or frames, F F, at suitable intervals; at each section end the boiler-plate is turned inwards, so as to form an internal flange, G, and it is these flanges, which, being ultimately rivetted together, form the permanent connections between the sections. An external flange, H, which is rivetted to fit the shape of the tube, is attached near the end of each section, which is to be placed farthest from the shore at which the work is actually commenced. This flange is placed at a short distance from the section end, and extends all round it, except at the bottom. The end of each section which it is to be placed nearest the shore at which work is commenced—barring that of the first section—has rivetted on it other plates, forming a short length of slightly larger tubes, J, the end of which is turned outwards, so as to form an external flange to correspond with, and be attached to, the other outer flange, H, fitted at the other end of the preceding section. Before these sections are placed in permanent positions these outer and inner flanges have holes drilled for bolts and rivets. The openings left by the internal flanges, G—the drilled holes in which are temporarily plugged to exclude the water—are next covered by somewhat larger boiler-plates, bulk-heads, or diaphragms, K, which are attached always on the inner side of the flanges, G, by means of screws with heads towards the inside of the section. Each bulk-head is provided with a man-hole, closed by a shutter, L, fitted to that side of the bulk-head which is nearest the shore from which the work is commenced. The subterranean or other approach to the subaqueous portion of the tunnel is constructed in the usual manner by coffer-dams, &c., for excluding the water, while the first section of the iron portion of the tunnel is being laid or connected with or built into the brick or stone portion. This joint should be made sufficiently far in shore to be completely covered by the earth, so that the water may be the more perfectly excluded, and the chance of a subsequent leakage lessened. A water-tight bulk-head or diaphragm may be then fitted to the inner side of the internal flange at the end of the section farthest from the shore, and secured by screws passing through it into the flange slip of vulcanised india-rubber, supposed to be placed between the flange and the bulk-head, to render the joint water-tight.

The commencement of the work being thus prepared, the coffer-dams may now be removed, and the whole course of the tunnel levelled, as the inequalities of the bottom are sure to render this more or less necessary. The tunnel sections, which are supposed to have both ends closed in the manner just described, are now ready to be placed in position. In the lowering of these sections Mr. Raynor proposes to use a vessel of the Castalia type, composed of two hulls, placed side by side, at a sufficient distance from each other to admit of a tunnel section being lowered between them, and fitted up with a platform, on which the section may be placed previous to its being lowered. When all is ready the sections are let down one by one on guide-rods, and screwed together by divers below, much after the same manner as has already been described. To the shore-side of the bulk-head a water-gauge is fixed, to show the height at which the water stands between the bulk-heads and a tap, G*b* (Fig. 4), is filled near to the bottom, for the purpose of drawing off the said water. The joint having been found to be sufficiently water-tight, the shutter, L, in the first bulk-head is unscrewed and removed, when the water-gauge may then be attached to the next bulk-head, to ascertain that the next section is free from water, when the same test is again applied. When the water has been drawn off, and the joint of the outer flange proved water-tight, workmen may now enter the fixed section. They now withdraw the plugs from the holes intended for the reception of rivets or bolts in the inner flange, which, if necessary, may be further tightened up by screw-bolts before red-hot rivets are inserted in the holes, and the inner flanges rivetted in the ordinary way. The contraction of the cooling rivets brings the surfaces of the flanges into very close contact, and renders the section-joints perfectly water-tight. The other bulk-head may now be removed after the manner just described, and so on, when the work reaching the opposite shore the final section is laid, so as to bring it close up to the brick abutment, previously prepared to meet it, when the divers may lay in the hydraulic cement the few courses of bricks required to make a sound junction.

Although the foregoing remarks apply in special to the form of tunnel section shown in Fig. 4, with flat bottom, still they also hold good, to a great extent, in cases where cylindrical, or nearly cylindrical, tubes are used—such, for instance, as represented in Figs. 6, 7, 8, 9, and 10. From the top of the tunnel downwards to the point at which the greatest width is attained the flanges will be in all respects as previously described; but from that point downwards their order must be reversed—that is to say, the flange which extends beyond the end of the tube itself must be on the section first fixed, while the flange, which is set back a short distance from the end of the section, must be on that section which is lowered on to the other, as shown in Figs. 6, 7, 8, and 9, in which R is the tube forming the sections of the tunnel with their internal flanges marked with the top S S. The external flange, T, of the upper half of the tube, and the fitting together of these cylindrical sections, is clearly shown in Fig. 10.

It must be admitted that the joining together of the sections shows great ingenuity, and we do not doubt that this plan could be practically carried out, which, if successfully accomplished, would no doubt create more or less a large demand for wrought-iron, according to the length of tunnel constructed, which demand would undoubtedly exercise a beneficial result in our depressed iron markets. No doubt the great discussion which has of late years taken place on the so-called international communication schemes has also called the present tunnelling scheme into existence; therefore, we may consider its suitability to the work in question. Without any wish of detracting from the merits of Mr. Raynor's plan, it will be seen to share the objections that have been raised against subaqueous ways in general. It is by no means certain that, even for the saving of an hour or so, and an immunity from sea-sickness, the majority of passengers would prefer a subaqueous passage, with the knowledge that but a few inches of metal were interposed between them and a second deluge. All subaqueous ways, especially those that are laid on ocean or channel beds, are apt to become more or less injured by the dragging anchors of ships or damaged by sinking vessels, or they might possibly suffer at shore ends, and could be destroyed wantonly, and with little fear of detection. All this would be anything but reassuring to the timid, and it would have its due weight with the strong. We live, however, in an advancing industrial age, and when better means of transport are afforded it is impossible to predict the stimulus it will give to travelling and international intercourse.

NICKEL, AND ITS PREPARATION.

Nickel is not an abundant metal, and although it occurs in a dozen different ores, the number of localities where it is found in paying quantities is very few. It is never found in a metallic state, except in meteorites. In ores, it is generally associated with iron and cobalt, both of which it resembles. The principle source of nickel is the native arsenide, a copper-coloured mineral, called by the Germans *kupfer-nickel*, or false copper, because it contains no copper. This ore contains from 33 to 55 per cent. of arsenic, 33 to 45 per cent. of nickel, and small quantities of sulphur, iron, and other substances. Another compound of nickel and arsenic has received the name of cloanthite, or white nickel. Annabergite, or nickel bloom, is a compound of arsenic acid with oxide of nickel, quite soft and of an apple green colour. The most beautiful nickel mineral is the sulphide, or millerite; it has a brass yellow colour and metallic lustre, and usually occurs in capillary crystals, in the cavities and among the crystals of other minerals, hence called capillary pyrites. In this country it is found chiefly in Lancaster, Pa. The other nickel minerals are breithauptite, nickel glance, ullmanite, emerald nickel, pyromelin, grunanite, pimelite, garnierite, and noumeite. Speiss is a deposit formed in the pots in which roasted arsenide of cobalt, mixed with copper nickel, is fused with carbonate of potassium and quartz, for the preparation of smalt, in the blue colour works; it collects below the blue glass, in the form of a metallic alloy, the nickel not oxidising so easily in roasting as the cobalt. It is an important source of nickel.

Of the metallurgy of nickel little is known outside of the works, which are carefully guarded, although it is difficult to see of what use a knowledge of a process could be to those who have no source of material at hand, or why those who have a monopoly of the ore need fear competition. Prof. C. Küntzel has, however, published some interesting facts in regard to the method used in the metallurgy of nickel, from which we glean the following:—

The preparation of metallic nickel and cobalt is sometimes conducted in the dry way, by collecting and concentrating the nickel, cobalt, and copper, in an arsenical or sulphur compound (*speise*, or stone), while at the same time, the iron in the ores is removed by scorification; the cobalt is afterwards fluxed with pure quartz sand, and the protoxide of cobalt precipitated, from the silicate of cobalt thus formed, by fusion with excess of carbonate of soda; the sulphur or arsenic is expelled from the *speise*, which has had the cobalt removed by roasting and heating with soda and saltpetre, and finally reduced with carbon. It is more frequently obtained in the wet way, by dissolving the nickel and cobalt ores in acids and separating the dissolved metals; but the greater part of the iron should first be removed and the nickel and cobalt concentrated before dissolving. In the dry method the first step is also to get rid of the iron in the ore or *speise*. The complete separation of iron from arsenical compounds of nickel and cobalt is not very difficult, for iron has much less affinity for arsenic than cobalt or nickel; but to separate it from the sulphides was, until recently, very difficult, if not impossible. The reason of this is that nickel and cobalt have nearly the same affinity for sulphur that iron has. This operation is now accomplished by smelting the raw ferruginous ore in a reverberatory furnace, with a mixture of two parts of fine barytes and one part quartz sand; for 1 per cent. of iron, 18 to 19 per cent. of this flux is required. A fusible ferro-silicate of barium is formed and sulphurous acid driven out. In 1870 Dr. R. Wagner proposed to make use of the oxidising action of the Chili saltpetre for removing the iron, sulphur, and arsenic. For arsenical products this method is inferior to the one generally employed—roasting the metallic arsenides after the iron has been removed, then heating with saltpetre and soda. Wagner's method may be employed with advantage when it is desired to smelt a nickel ore, which has been freed from iron, with a metal free from sulphur, provided it contains enough copper to prevent the resulting metal from being too infusible.

The manufacture of nickel in the wet way varies with the material or source. The principal steps are the following:—1. Dissolving the roasted products in hydrochloric or sulphuric acids.—2. Precipitation of the iron by means of lime or carbonate of lime or soda, after oxidising, if necessary, with chlorine or chloride of lime.—3. Precipitation of the copper with sulphuretted hydrogen, or alkaline sulphides.—4. Precipitation of the cobalt as sesquioxide by means of chloride of lime.—5. Precipitation of the nickel as hydrated oxide or carbonate with milk of lime or carbonate of soda.—6. Igniting this precipitate so as to obtain an hydrous oxide of nickel, insoluble in dilute acids.—7. Leaching out the excess of lime and gypsum from the ignited oxide of nickel.—8. Reduction of the pure oxide of nickel by ignition with charcoal.

In dissolving nickel ore care should be taken to prevent silica going into the nickel solution, for on neutralising the previously acid solution all the silica is precipitated in the form of silicate of nickel. Sometimes in analyses a small quantity of silicic acid runs through all the operations, and there is no simpler method of removing it entirely at the start than by adding to the neutral solution some neutral nickel salt.

For precipitating the copper with sulphuretted hydrogen Gerstenhoefer's precipitating tower, which was first employed at Freiberg to precipitate arsenic from sulphuric acid, may be employed. Such an apparatus avoids any escape of the gas, and precipitates the metals in the shortest possible time. The solution enters automatically at the top of the tower, which has an hydraulic seal. It falls drop by drop down into an atmosphere of sulphuretted hydrogen, passing from one platform to another, and if it does not contain too much copper it passes out at the bottom free from copper. The gas which is absorbed by the nickel solution is expelled by heating it with steam. If a soda ash works is near, the waste sulphide of calcium may be employed with profit for precipitating the copper. Injury to the workmen from inhaling sulphuretted hydrogen can be prevented by the use of wine or spirits; sulphuretted hydrogen retards the circulation of the blood, which is neutralised by the property that alcohol has of accelerating the circulation.

Nitrate of potash cannot be employed to separate nickel and cobalt when there is lime in the solution. In this case it cannot even be used as a test; for in the presence of lime or other alkaline earth a yellow precipitate is formed similar to nitrate of cobalt and potash, and said to have the composition $K_2 Ca Ni (NO_2)_6$. If there is enough lime present all the nickel is thrown down as a double nitrite.

Cobalt and nickel may be separated by means of sulphate of ammonia and sulphuric acid, if the quantity of cobalt is not too small relatively. The separation is quite exact if the solution is sufficiently concentrated. The nickel separates as a difficultly soluble double sulphate of nickel and ammonia, while the double salt of cobalt remains in solution. From the former the sulphate of ammonia is expelled by heating in clay pipes. The sulphate of nickel is almost entirely converted into oxide by roasting with charcoal; the last trace of sulphur is removed by igniting with soda and saltpetre.

The best method of removing the sulphate of lime is to extract the excess of lime added with hydrochloric acid water, then to boil the oxide with steam, and add slowly such a quantity of carbonate of soda that, after boiling a quarter of an hour, there is still an excess of the carbonate in the solution. Sulphate of soda and carbonate of lime are formed; the first is washed out with water and the latter with water acidified with hydrochloric acid.

Oxide of nickel can be reduced at a bright red heat by simple contact with coarse broken charcoal. The reduction extends inwardly from the surface of the cubes. If left in contact with the carbon after it is entirely reduced, it absorbs more and more carbon. The reduction usually takes place on the clay crucibles on the hearth of a flame furnace. At Val Benoit, near Luttich, a continuously working furnace is used, the reduction being accomplished in upright tubes.—E. J, H.—*Scientific American.*

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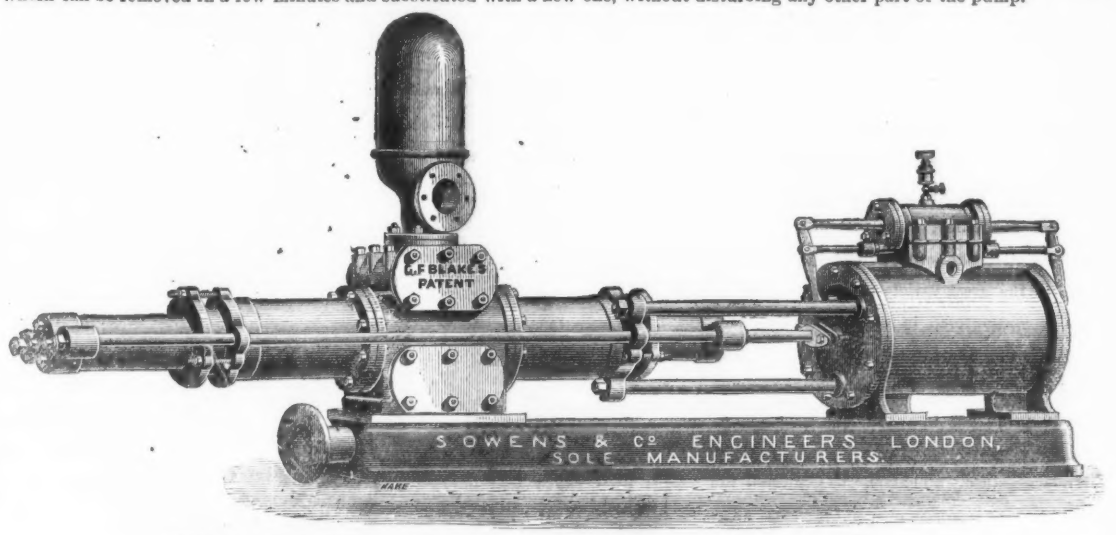
And at 195, Buchanan-street, Glasgow (W. HUME, AGENT).

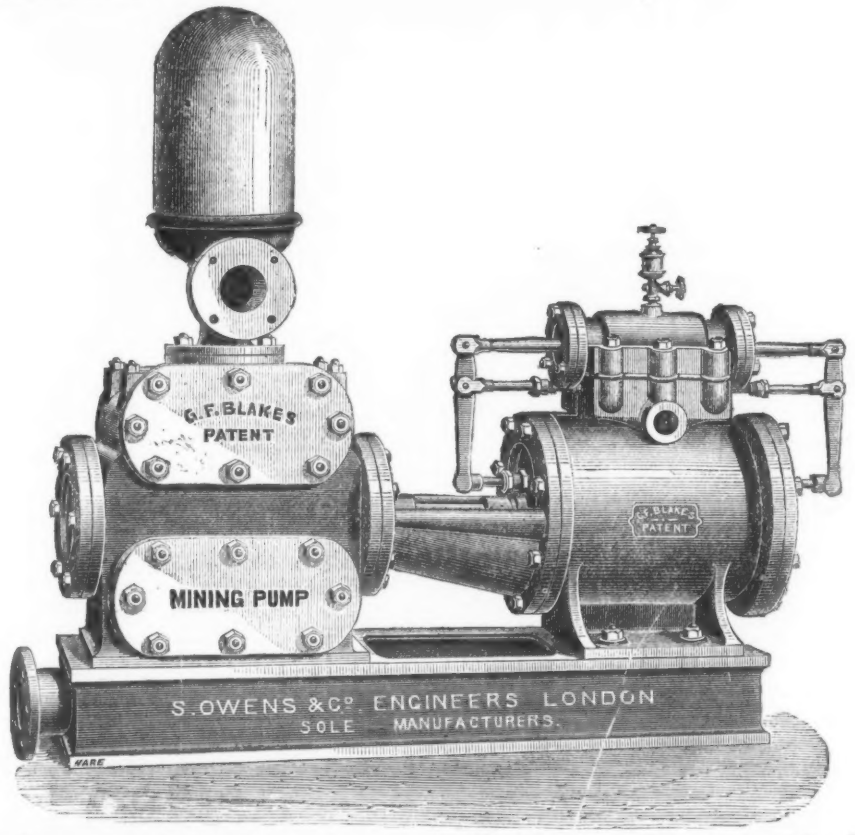
These PUMPS from their SIMPLICITY, RELIABILITY, DURABILITY, and ECONOMY are SPECIALLY SUITED FOR MINING PURPOSES, where large quantities of water require to be raised from great or medium depths with CERTAINTY. They are double-action in their construction, throwing a constant stream of water, can be made of any stroke to suit the space in which they have to work, can be arranged with any combination of steam and water cylinders to suit the pressure and lift against which it is desired to work them, are made of the very best materials and highest class of workmanship, and all working parts can be readily got at by any ordinary workman, and replaced if necessary by a duplicate part (all such being interchangeable) in the shortest possible time. For situations where gritty and sandy water has to be pumped the DOUBLE-PLUNGER PATTERN is recommended. Where space is limited the PISTON PUMP is better suited, a novel feature of which is the PATENT REMOVEABLE LINING, which can be removed in a few minutes and substituted with a new one, without disturbing any other part of the pump.



Blake's Improved Double-plunger Steam Pump.

S. OWENS AND CO.,

In placing the BLAKE STEAM PUMP before the mining world, believe they are offering the BEST, MOST RELIABLE, and ECONOMICAL PUMP that has yet been made, and solicit an inspection of various sizes in operation at their works, Whitefriars-street, Fleet-street, London.



Blake's Improved Mining Pump, with Patent Removeable Lining to Pump Cylinder,

Any combination of these Pumps may be had to suit circumstances. The following are some of the SIZES SUITABLE FOR MINING PURPOSES:—

Dia. of steam cylinders.. In.	12	12	12	12	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	24	24
Dia. of water cylinders.. In.	3	4	5	6	4	5	6	4	5	6	8	4	5	6	8	5	7	8	9	6	8
Length of stroke ..... In.	18	18	18	24	24	24	24	24	24	24	24	24	30	30	30	30	30	36	36	36	42
No. of strokes per minute..	30	30	30	30	25	25	25	22	22	22	22	22	22	22	22	20	20	17	17	17	15
Quantity in gallons per hour, approximately ...	1440	2610	4200	5940	2940	4620	6600	2646	4158	5940	10620	2646	5160	7500	13260	4586	9000	12360	15660	8720	12000

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The Blake Pump will work under water, and as efficiently with compressed air as with steam.

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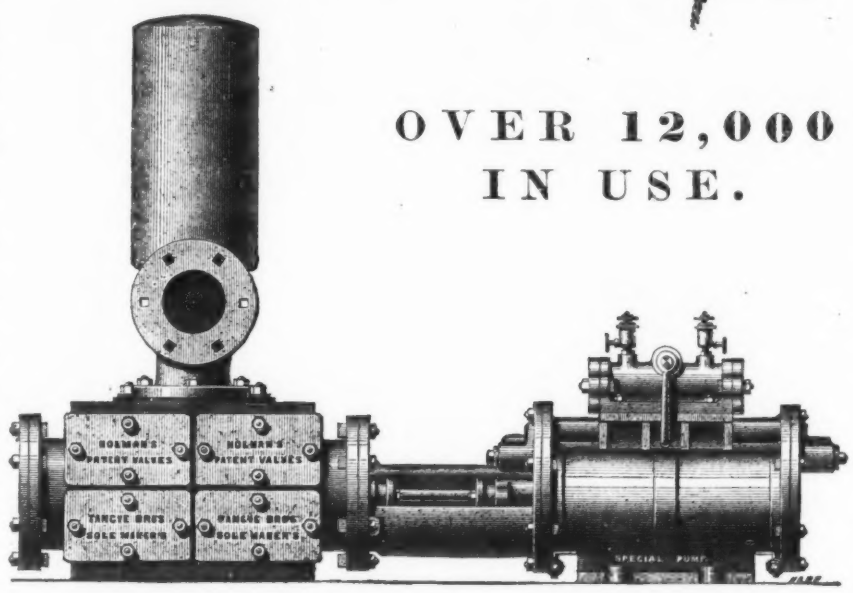

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WILLIAM ELLIOT, Esq., *of the Weardale Iron and Coal Company, writes under date Sept. 17th, 1875, as follows:*—"We have now THIRTY-FIVE of your SPECIAL STEAM PUMPS in operation at the various collieries under my charge—some of them employed pumping water out of our pits to the depth of 50 fms.—others employed in the pits, and a good many feeding Boilers. I have no hesitation in saying that we have found them the Cheapest and Best Pumps of the kind we have tried. I can with confidence recommend them to intending purchasers.

Messrs. BURT, BOULTON, and HAYWOOD, *Chemical Manufacturers, of London*, have also THIRTY-EIGHT of the "SPECIAL" STEAM PUMPS in use at their works, and continue to order more.

GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

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Diameter of Water Cylinder ...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6
Length of Stroke .....In.	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	12	12	12	18	24	12	12
Gallons per hour	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,519	5070	7330
Price .....£	16	18	20	25	22 10	27 10	32 10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70	85	55	60

CONTINUED.

Diameter of Steam Cylinder..In.	10	10	10	10	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	18	18	18	18			
Diameter of Water Cylinder..In.	7	8	9	10	6	7	8	9	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14			
Length of Stroke ....In.	12	18	24	24	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24			
Gallons per hour	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000			
Price .....£	55	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	140	150	160	180	200	180	190	210	230			

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 60 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36 48 and 72-inch Strokes.

Holman's Patent Self-acting Exhaust Steam Condensers,

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TURNS WASTE STEAM INTO GREAT POWER.

REQUIRES NO THREE-WAY COCKS, CHECK, or REGULATING VALVES.

SAVES HALF ITS COST IN PIPES AND CONNECTIONS.

PREVENTS ALL ESCAPE OF STEAM IN MINES OR ELSEWHERE.

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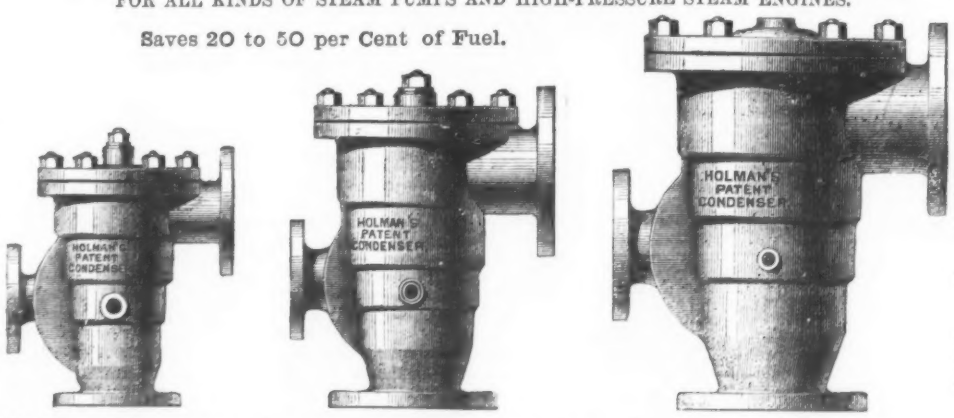


These Condensers are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam, they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine, and effecting a saving in fuel of from 20 to 50 per cent.

In Mining operations these Condensers will be of great value.

All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:—

MORLEY COLLIERY, WIGAN, October 16th, 1874.

Messrs. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN,—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the strict economi: sense, a most valuable feature in the drainage of underground workings. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10¾ lbs. per square inch, even when we run the Pump upwards of 80 strokes (106 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 84 strokes (168 feet) per minute, the steam gauge indicating a steam pressure of 36 lbs. per square inch, 80 yards from the Pump, and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time. (Signed) J. THOMPSON.

from 30s. to 40s. per inch diameter of Steam Cylinder, according to the relative Diameter of Pump for which Condenser is required.

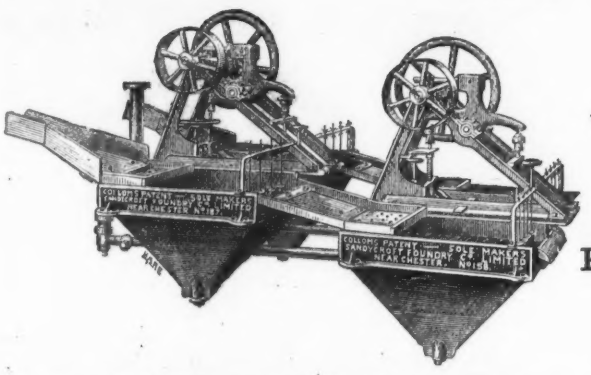
NORTH OF ENGLAND HOUSE ... ... TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
SOUTH WALES HOUSE... ... ... TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

PATENT IMPROVED ORE WASHING & DRESSING MACHINES.

THE SANDYCROFT FOUNDRY & ENGINE WORKS CO. (LIMITED), NEAR CHESTER

LATE THE MOLD FOUNDRY CO. (ESTABLISHED 1838).

SOLE MAKERS IN GREAT BRITAIN.



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Will supply Designs, and all the necessary Plant for laying out Dressing Floors; also

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PUMPING & WINDING ENGINES,

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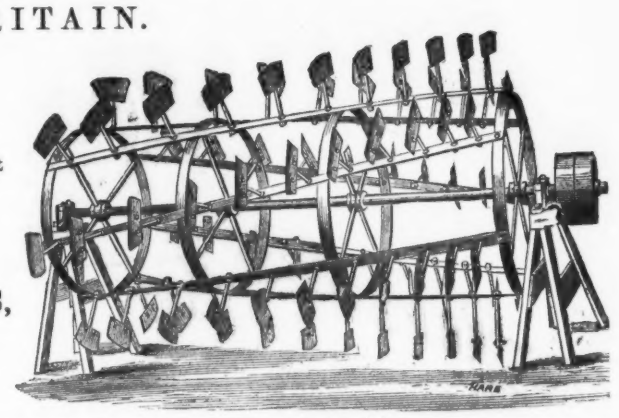
OF PECULIARLY HARD AND TOUGH MIXTURE

&c., &c.



COLLOM'S PATENT AUTOMATIC ORE WASHING MACHINE, working at the following and many other Lead, Copper, Blende, and Tin Mines:—Great Laxey, Cape Copper, Pontgibaud, Linares, Alamillos, West Tolgus, Lisburne, Minera Halvans, Snailbeach, &c.; and also at Messrs. Vivian and Sons' Works, Swansea.

PATENT IMPELLER, OR KNIFE BUDDLE, in use at the following and many other Lead, Copper, Blende, and Tin Mines:—The Van, Roman Gravels, Tankerville, Ladywell, Lisburne, East Black Craig, Old Treburgett, Penhale & Barton, Bog, Linares, Fortuna, Alamillos, Minera Halvans, &c.

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Is the MOST SIMPLE and ECONOMICAL DRILL now in use.

BOILERS; AIR COMPRESSORS, worked by Hydraulic or Steam-power; STEEL for MINING DRILLS; PUMPING, and all other MINING MACHINERY supplied.

For Prices, Estimates, and other Particulars, apply to—

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For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.,

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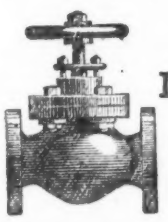
of which upwards of 8684 have been made to March, 1875.



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ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.

SALFORD IRONWORKS, MANCHESTER.

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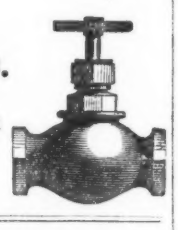

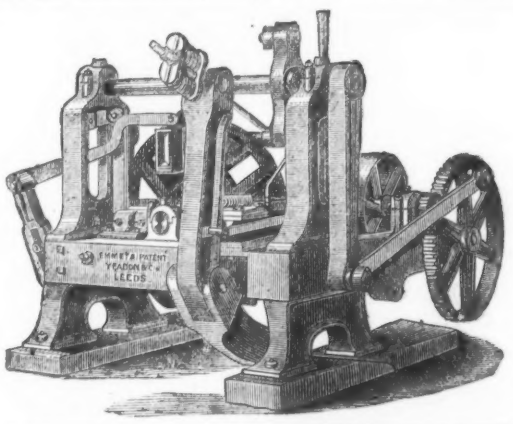

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A1 PATENT BRICK MACHINE.

Massive; durable; cheap; takes little power, and gives PERFECT SATISFACTION.

This is the ONLY Machine which presses the Brick equally on BOTH sides, each plunger entering the mould plate $\frac{3}{8}$ in., and turning out 12,000 SQUARE, SOLID, PRESSED Bricks per day, READY AT ONCE FOR THE KILN.

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D., C., and S. beg to call special attention to the advantages to be derived by adopting their EXTRA STRONG IMPROVED STEEL ROPES, for lifting heavy loads in deep mines, also in hauling from long distances; a considerable reduction is effected in weight, friction materially reduced, and an extra amount of work got out of the rope—a rope 8 lbs. per fathom being equal in strength to an iron rope 20 lbs. per fathom, or an ordinary steel rope 12 lbs. per fathom.

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W. and S. FIRTH undertake to CUT, economically, the hardest CANNEL, ANTHRACITE, SHALE, or ORDINARY COAL, ANY DEPTH, UP TO FIVE FEET.

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(LIMITED),

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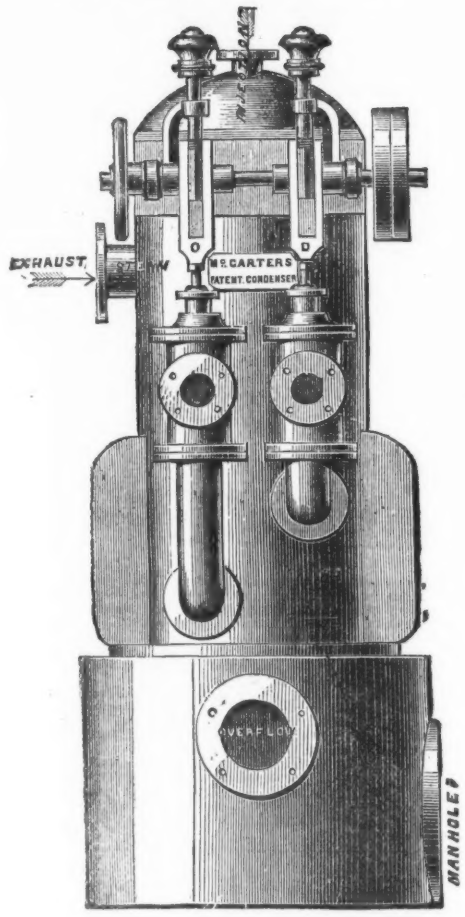

These Condensers can be placed inside or outside of the engine-house. They draw their own injection water, and require no foundation. Specially adapted to Pumping and Winding Engines, effecting a saving from 20 to 30 per cent. in coal, and increases the power of the Engine.

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ONE MILLION STERLING

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PAID-UP CAPITAL AND RESERVE FUND, £180,000.
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Bonus allowed to Insurers of Five Years' standing
Apply to the Clerks at the Railway Stations, the Local Agents, or—
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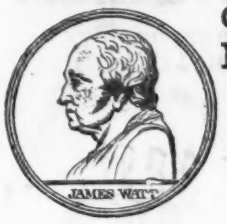

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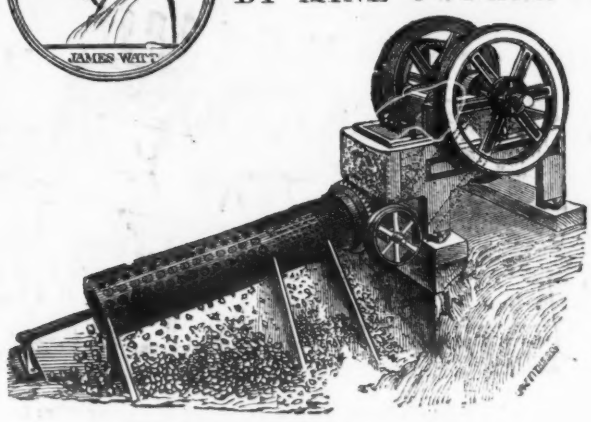
1150 NOW IN USE.

ROYAL CORNWALL POLYTECHNIC SOCIETY INSTITUTED 1833 FIRST CLASS



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AT ALL THE PRINCIPAL WORKS IN THE KINGDOM.

Takes in 20 in. by 9 in., and is shown by TESTIMONIALS to be breaking from 1000 to 1200 tons per day of 10 hours, at THREE HALF-PENCE PER TON.

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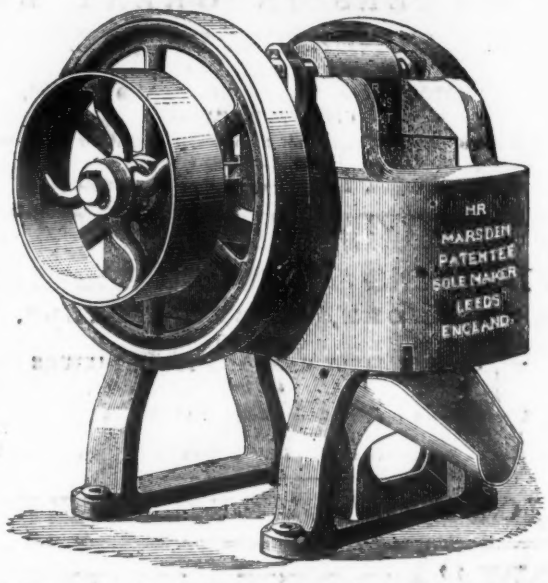
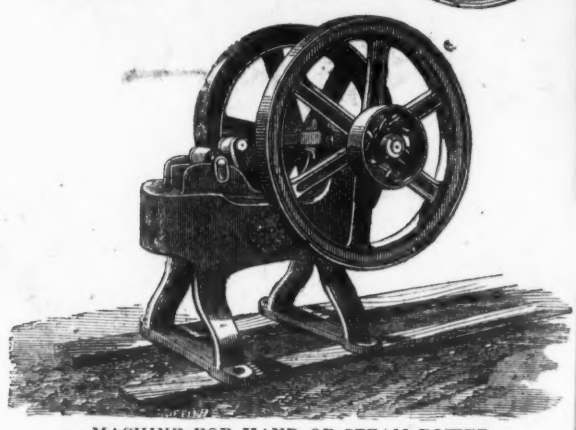


"The Machine is well designed, simple, but substantially made and is capable of reducing any material to fine gravel, such as copper ore, and is certainly preferable to the stamps in use for that purpose."—*Mining Journal.*



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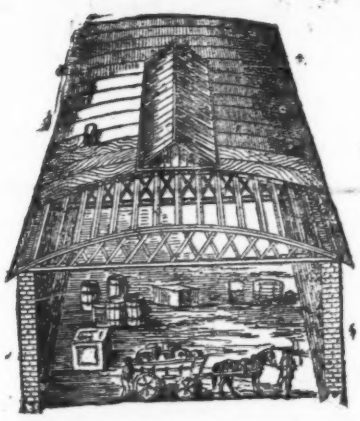

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PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

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By a special method of preparation, this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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SUBJECT TO DISCOUNT.

IMPROVED AIR COMPRESSORS.

Makers of Pumping and Winding Engines, Steam Hammers, Boilers, Pump Pipes, &c., &c. Castings of all kinds.

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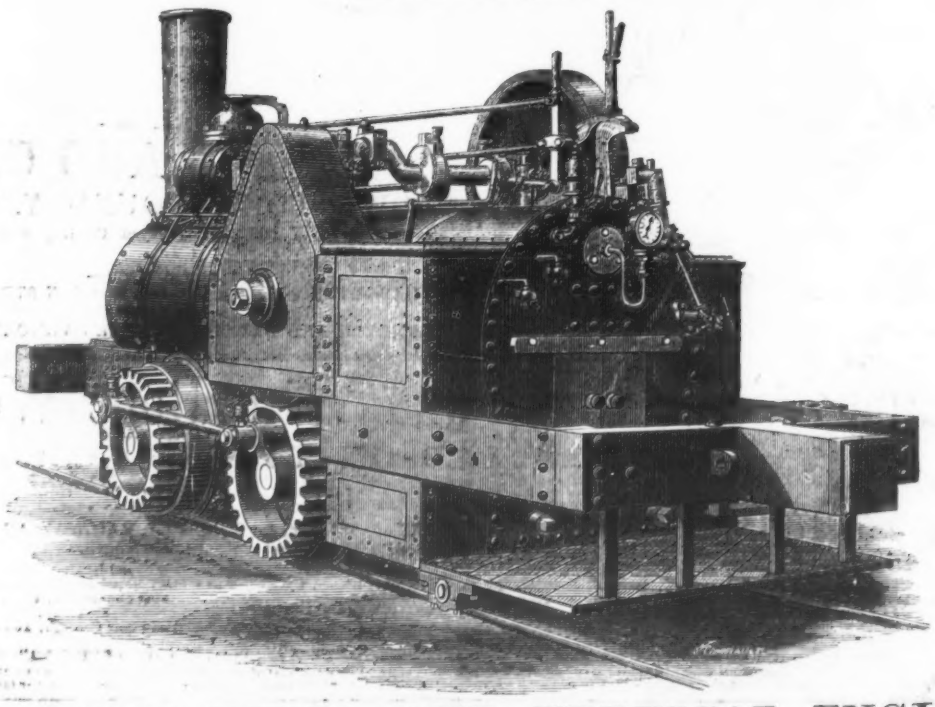
Speciality in cheap colliery and contractors' Locomotives, and very small Locomotives for replacing Horses.

Prices from £300 upwards.



PORTABLE FIXED AND VERTICAL ENGINES

WINDING AND PUMPING GEAR.

The above represents LEWIN'S STEEL-GEARED LOCOMOTIVE, from a photo of one working on a 22 in. gauge, for replacing horses

STREET AND ROAD TRAMWAY LOCOMOTIVES,

ON THE MOST IMPROVED PRINCIPLE.

Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors) at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*December 30, 1876.*

ROYAL ACADEMY OF SCIENCES

OF TURIN

THE BRESSA PRIZE.

The last will and testament of Cesare Alessandro Bressa, Doctor in Medicine and Surgery, signed the 4th September 1835, contains the following clause:

« I leave all my property present and future, after paying certain legacies, to the Royal Academy of Sciences of Turin. The Academy may be represented by its Secretary, or by an attorney elected for that purpose by the resident members.

» On the decease of Signora Claudia Amata Dupêché, who has a life interest in all my possessions, the Royal Academy of Sciences of Turin will immediately enter in possession of everything, and may sell ground property, put capital out to interest, in any and whatever way it may find most profitable, and with the interest of this property a biennial prize is to be established, which will be adjudged in the following manner, viz: —

» The net interest of the first two years to be given in premium to that person of whatever nation or country he be, who shall have,

during the previous four years, made the most important discovery, or published the most valuable work on Natural and experimental Philosophy, Natural History, Mathematics, Chemistry, Physiology and Pathology, as well as Geology, History, Geography and Statistics.

» The net interest of the following two years to be given only to an Italian, who, by judgement of the above named Academy of Turin, shall have made the most important discovery, or have published the most important work, on any of the above mentioned sciences.

» The prize will continue to be distributed in the same order ».

While fully aware of the great responsability which rests on it, in being called to judge the productions of human intellect in a sphere so vast as to comprise nearly all the positive sciences, the Academy has accepted the task, with the intention of fulfilling to the utmost the generous wishes of the testator with regard to the promotion and advancement of Science.

The Bressa legacy remained free from all claims the month of July 1876, consequently the first biennial term mentioned in the will, will include the years 1877-1878.

The first prize will be given in the year 1879 to that person, of whatever nation or country he be, who shall have, during the four previous years, made the most important and useful discovery, or published the most celebrated work, on any of the above mentioned sciences.

The value of the first prize amounts to 12,000 Italian Lire.

In accordance with the spirit of D.r Bressa's will, the Academy will choose the best work or discovery, whether, or not, it be presented by the Author.

The prize in no case will be given to any of the National members of the Academy of Turin, resident and non resident.

In the year 1881 the second Bressa Prize will be given for the preceding quadriennial term 1877-1880, according to the above rules, except that in obedience to the testator's wishes it can only be conferred on an Italian.

And so on, every four years there will be a Bressa Prize for competition among scientific men of any part of the world, and every four years a Bressa Prize, which can be competed for by Italians only.

Turin December 7th 1876.

THE PRESIDENT OF THE R. ACADEMY

FEDERIGO SCLOPIS.

The Secretary of the Class of physical and mathematical Sciences

ASCANIO SOBRERO.

The Secretary of the Class of moral, historical and philological Sciences

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